

SPINE INJURIES DURING THE SIX-DAY WAR

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IN this paper we shall present data about the clinical course, final outcome and rehabilitation of the cases of nine soldiers (eight paraplegics and one quadriplegic), wounded in their spines during the six-day war in June 1967. They were hospitalised in our department for three months up to more than one year (after having received initial treatment in the departments of neurosurgery, orthopedics, general surgery, chest surgery, or in two or three of these together). These soldiers constitute more than 60 per cent. of injured combatants of this kind in this war.

In the following Tables (I to VI), site of injury, initial symptomatology, complications, course of treatment and the features of final rehabilitation shall be

TABLE I

Name	Cause	Initial findings	X-ray
M.M.	Shrapnel	Paraplegia (cauda equina); sensory level L2	Fracture of lamina L3
A.D.	Bullet	Complete tetraplegia sensory level TH1, hypotension. Bradycardia. Respiratory arrest	Fracture of lamina C5
D.P.	Shrapnel	Paraplegia, sensory level TH4 shock	Fracture of lamina TH4, TH5
M.K.	Shrapnel	Paraplegia, sensory level TH11	Fragment between TH11 and TH12
B.G.	Shrapnel	Paraplegia (cauda equina), sensory level L5	Fracture & ant. dislocation of L5
Y.S.	Shrapnel	R. monoparesis. Hyperalgesia R. arm	Fracture of C5, 6
L.A.	Mine	R. hemiplegia. L. Hemi-anesthesia Brown-Séquard's syndrome, shock	Fracture of C5, 6
A.H.	Car accident	Paraplegia (cauda equina), sensory level S1	Fracture-dislocation L1
M.I.	Car accident	Paraplegia, sensory level D5	Fracture-dislocation D7

illustrated. It goes without saying that only very well organised teamwork on the part of the whole staff, co-operation with the extremely helpful authorities of the defence ministry, intensive aid on behalf of the colleagues of many other departments, particularly those of urology and psychiatry; furthermore, a co-ordinated psychological approach on behalf of each member of the team, physiotherapists, occupational therapists, nurses and social workers included, with much time devoted to the individual problems of each patient—and last but not least—a very active and constructive co-operation of the patients themselves, almost without exception, have rendered possible some remarkable achievements in rehabilitation. It should be stressed that we were able to give every intensive individual treatment in every regard because of the relatively small number of these cases and because of the emotional attitude of the whole staff toward this group of soldiers. We do not intend to describe the routine measures and treatment in these cases centred on physical therapy, occupational therapy, psychotechnical tests, prevocational training, evaluation and preparation of appropriate housing accommodations, etc.

Table I shows the initial findings.

Table II describes the relatively great amount of additional injuries and their

TABLE II

Name	Additional injuries	Surgery
M.M.	None	Laminectomy of L2-L3
A.D.	Bullet through esophagus	Laminectomy of C5-TH1. Tracheostomy. Feeding gastrostomy
D.P.	Haemothorax. Intestinal lacerations. Fractures of L. tibia & fibula, R. ankle, R. olecranon. L. ulnar paresis	Thoracotomy. Laparotomy. Open reduction of fractures
M.K.	Haemothorax. Intestinal lacerations. Fractures of L. radius & ulna	Thoracotomy. Laminectomy of TH10-12. Laparotomy. Re-exploration of wound
B.G.	None	Laminectomy of L3-5. Re-exploration of wound
Y.S.	None	None
L.A.	Tear of R. int. jugular vein. traumatic amputation R. arm below elbow. Haemothorax	Tracheostomy. Suture of jugular vein. Thoracotomy. Surgical re-amputation
A.H.	None	Laminectomy of L1. Plate fixation
M.I.	None	Open reduction. Plate fixation

treatment. In more than half of the cases, laminectomy has been performed; it remains open for discussion whether this was necessary in each case.

Table III shows the bladder and bowel condition and sexual function. Only in two cases intermittent catheterisation has been applied almost from the start, due to the devoted effort of my junior assistant, Dr. R. Rozin. This method has proved its superiority over all other methods not only in these two cases, but we have at this very moment in our department, three other cases having been injured by accidents, which are being successfully treated in this same way. As you may see from this table, five of the victims have normal bladder-function, two achieved an automatic bladder and two (one of them the quadriplegic) a partial automatic bladder. The bowel-motions are regulated in all cases rather satisfactorily. As for the sexual function, only in three cases normal function exists; in all other cases either erection was present or even this did not happen.

TABLE III

Name	Bladder	Bowel	Sexual function
M.M.	Foley catheter for 26 days	Normal	Normal
A.D.	Foley catheter for 165 days. Reflex micturition & intermittent catheterisation (partial automatic)	Regulated by laxatives	Erection present
D.P.	Foley catheter for 100 days. Reflex micturition (automatic)	Laxatives	No erection
M.K.	Foley catheter for 96 days. Reflex micturition (partial automatic)	Laxatives	No erection
B.G.	Foley catheter for 37 days. Normal micturition	Regulated by laxatives (no sensation)	Normal
Y.S.	Normal	Normal	Normal
L.A.	Foley catheter for 50 days. Normal micturition	Normal	Unknown
A.H.	Foley catheter for 18 days. Voluntary micturition (no sensation)	Regulated by laxatives (no sensation)	Impotence
M.I.	Foley catheter for 16 days. Intermittent catheterisation (automatic)	Regulated by laxatives	Erection present

Table IV deals with complications. Attention is drawn to cases No. 2 and No. 4. In the first we had the oesophageal fistula and in the second a real psychotic behaviour and even today there exists a chronic osteomyelitis.

Table V shows the final clinical findings and final functional conditions, except for case No. 7 whose fate is unknown to us. Only the tetraplegic is entirely dependent.

Table VI shows the vocational rehabilitation. It should be stressed that the quadriplegic, thanks to the attitude of the University and the Professor of Mathematics, is able to attend to these studies; the 8th case has, in the meantime, returned to work with his father in his factories abroad; and the 9th case has started with studies at the University.

In other words, all the cases are vocationally rehabilitated.

Summarising, we may conclude:

1. A short report is given of nine cases of spine lesions in soldiers wounded during the six-day war, hospitalised in the Hadassah University Hospital in Jerusalem and treated in the Department of Physical Medicine and Rehabilitation.

TABLE IV

Name	Complications	Treatment
M.M.	Pains (causalgiform?)	Phenergan, Optalgin
A.D.	Oesophageal fistula (infected) pneumonia, urinary infection, calcifications around R. hip joint	Antibiotics, mandelamine, Gantrisin
D.P.	Pneumonia	Antibiotics, Mandelamine, Gantrisin
M.K.	Acute psychosis. Urinary infection. Osteomyelitis of TH11-12 with fistula	Antibiotics, chlorpromazine, Mandelamine, Gantrisin.
B.G.	Pains (causalgiform?). Osteomyelitis of L5 with fistula	Phenergan, Optalgin, Antibiotics, plaster jacket for 5 mths.
Y.S.	None	None
L.A.	Cardiac standstill, cerebral anoxia, loss of memory	Resuscitation, antibiotics. Crutchfield tongs
A.H.	Urinary infection	Antibiotics
M.I.	Pleural effusion	Pleural puncture, antibiotics. Mandelamine, Gantrisin

2. Initial symptomatology and treatment, complications, their handling, sphincter-function, vocational program and rehabilitation are outlined in tables.

3. Special emphasis is laid on the use of intermittent catheterisation as a procedure of choice for the neurogenic bladder.

4. Only a few complications occurred and they did not seriously aggravate the outlook for rehabilitation. This can be explained by the limited number of patients who were able to enjoy the utmost individual treatment by the combined effort of the staff and all other factors concerned.

5. Early vocational evaluation and its implementation during hospitalisation has added to the final success in the work of these cases.

6. Eight of the nine severely injured soldiers—the fate of the ninth is unknown to us—are either employed in useful work or are successfully studying toward the goal of gainful occupation.

TABLE V

Name	Present clinical findings	Present functional status
M.M.	Flaccid paralysis of L. leg. paresis of R. leg. Anaesthesia only in L ₅ segment	Walks freely with two long-leg braces. Independent
A.D.	Partial return of power: deltoid biceps, triceps bil., pect. maj. R. sensitivity no change. Mild spasticity	Sitting in wheelchair. Training with ballbearing feeder; typing, almost entirely dependent
D.P.	Same as initial. Flaccid	Swing-through gait with two long-leg braces. Almost independent*
M.K.	Same as initial. Flaccid	Swing-through gait with two long-leg braces. Almost independent*
B.G.	Paresis of both legs. Sensory level R.-S ₂ , L.-L ₅	Walks with two short-leg braces & crutches. Independent*
Y.S.	Muscle power almost normal	No limitations. Independent
L.A.	Some improvement of muscle power	Not known (transferred to another hospital)
A.H.	Bilateral paresis of dorsiflexors, saddle anaesthesia	Walks freely with one cane. Independent
M.I.	Same as initial	Swing-through gait with two long-leg braces. Almost independent

* Execution of rehabilitation procedures difficult due to additional injuries and complications.

TABLE VI

Name	Age	Disability	Previous occupation	Present vocational program
M.M.	24	Cauda equina	Farmer (Kibbutz)	Learned to drive—works in factory (Kibbutz)
A.D.	22	Tetraplegia	Medical student (freshman)	Learning English, studying Maths. University —towards work with computer
D.P.	20	Paraplegia	Electronic technician	Studying electronic engineering
M.K.	20	Paraplegia	Student of biology	Back at previous studies
B.G.	23	Cauda equina	Studied engineering	Learned to drive, back at previous studies
Y.S.	28	Monoparesis	Farmer (Kibbutz)	Back at previous work
L.A.	21	Brown-Séguard syndrome	Soldier—Regular army	Not known
A.H.	22	Cauda equina	Light industry—volunteer	Studying Hebrew
M.I.	19½	Paraplegia	Soldier—Regular army	Started driving lessons

STABILISATION OF THE SPINE IN TRAUMATIC PARAPLEGIA

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In traumatic paraplegia we have a condition wherein there is an acute damage to the spinal cord.

In man the spinal cord lies within a fluid bed surrounded by its membranes and is protected by the bony structure of the spine, which is formed anteriorly by the vertebral body, laterally by the pedicles, and the laminae form the posterior portion. This is not a solid tube, for to permit motion there are two sets of joints. The amphiarthrodial joints which are connected by intervening discs of fibro-