

AMBULATION WITHOUT WHEELCHAIRS FOR PARAPLEGICS WITH COMPLETE LESIONS

By H. NATVIG, M.D. and R. McADAM

The State Rehabilitation Institute in Oslo, Norway

Abstract. Some salient features of the physical training programme for paraplegics at the State Rehabilitation Institute in Oslo are mentioned. A ten-year follow-up study of 42 clients with complete lesions (T1-L3) is presented. After an intensive physical training programme of some 10-15 weeks 74 per cent were able to climb and go down 20 standard stairs and 71 per cent were able to walk 100 metres indoors with crutches. The authors stress the importance of ambulations independent of wheelchairs whenever this is possible.

Key words: Paraplegics; Complete lesion; Ambulation.

Introduction

THE State Rehabilitation Institute in Oslo admits clients with physical, mental and sociomedical ailments for medical and vocational rehabilitation. Since 1950 approximately 10-15 clients with complete and incomplete spinal cord lesions have been admitted to our unit annually.

In the beginning, it was apparent that one major obstacle to the successful vocational rehabilitation of our paraplegics was their inability to climb stairs and walk small distances indoors. (A finding in accordance with Hardy, 1957.) Consequently, we instituted a physical training programme aimed at overcoming this obstacle. With few exceptions this programme has been in operation ever since.

Programme

The client may be transferred to us weeks or months after the injury. Necessary steps are taken to prevent or treat pressure sores and urinary tract disorders. If warranted, bladder and bowel training is started (McAdam, 1973).

While waiting for his/her calipers (braces) the client is familiarised with the erect standing position either by strapping him to a tilting table, or preferably by allowing him to stand in the parallel bars with provisional walking appliances. At this stage, progressive muscle strengthening exercises are introduced, e.g. bodylifts (Fig. 1), arm exercises with weights, push-ups. Duration, load and repetitions are adjusted for strength and stamina.

After 3-4 weeks the paraplegic, accompanied by the physiotherapist, is asked to try the stairs with handrails. The success of this effort is mainly governed by the level of the lesion, his height, and his ability to extend both elbows when grasping crutch and handrail. Figure 2 shows a client on a spiral staircase. Severe spasms can make stair climbing difficult or even impossible.

The paraplegics are taught to fall without hurting themselves and whenever possible to get up unassisted. If the hip muscles do not function, the 'Swing-through' crutch gait is the one of choice. This gait calls for close cooperation between the therapist and client and interplay between the arms, head and shoulder



FIG. 1
Arm exercises and body lifts.



FIG. 2
After training: no difficulty with spiral staircase.

girdle in relation to a constantly changing centre of gravity as the client's body swings between his crutches.

When this technique is mastered, indoor walking is intensified. Distances and time taken to cover them are chalked up on the blackboard. When he can 'Swing-through' 100 metres at the required speed, he is obliged to go to the dining-room on his crutches. When he can achieve this three times daily, the wheelchair is proclaimed 'out of bounds' during working hours.

When all indoor activities are no longer a problem, the client progresses to activities out of doors. He learns how to ambulate on standard road surfaces, grass, gravel, ice and surfaces with a light covering of snow. Retractable spikes are attached to the crutch tips and removable non-skid appliances are fastened to his footwear. As confidence and dexterity increase, the client is taught how to gain access to public vehicles (trams, trains and buses) and how to get in and out of private cars without the use of wheelchairs.

The physical training programme is strenuous and may be compared to the gruelling demands made on athletes undergoing training.

As the client becomes physically proficient, vocational training is developed and accentuated in accordance with the Institute's aim which is the attainment of optimal function at work and in the community in general. In a series of 57 clients with complete and incomplete spinal cord lesions Kaasa and McAdam (1967) reported that 48, *i.e.* 84 per cent, started work after discharge from the Institute.

Own Material

In order to elucidate the effect of our physical training programme, a ten-year follow-up study of all paraplegics with complete lesions from TH1-L3 has been done.

Table I shows the material divided into three different levels of lesions corresponding to class 2, 3 and 4 at the International Stoke Mandeville Games, and the ages at the time of injury. All together there were 42 clients aged from 15-58 years, 3 females and 39 males. The following activities were registered in this follow up:

1. Ability to cope with 20 standard stairs with crutches.
2. Ability to walk 100 metres indoors with crutches.
3. Ability to walk 500 metres outdoors with crutches.

The duration in weeks from admission until the activity was accomplished satisfactorily was also noted.

TABLE I

Ten-year case material (1966-75), complete lesions.
Age and level of lesion for the age range 15 to 58, including three female

	T1-T5	T6-T10	T11-L3	Total
15-24	6	11	0	17
25-34	3	4	8	15
35 and more	0	3	7	10
Total	9	18	15	42

TABLE II
Accomplished after training with crutches

	T1-T5	T6-T10	T11-L3	Total
No. of patients	9	18	15	42
20 stairs up and down	7	13	11	31 (74 %)
100 m indoors	7	12	11	30 (71 %)
500 m outdoors	1	7	8	16 (37 %)

TABLE III
Duration of training. Coping with 20 stairs (17 cm)

	T1-T5	T6-T10	T11-L3
No. of patients	7	13	11
Weeks of training (average)	13	15	10
Range (weeks)	4-23	0-32	2-17

Table II shows the results at discharge from the Institute. Seventy-four per cent were able to cope with 20 stairs each 17 cm high. Seventy-one per cent managed 100 metres indoors on crutches while 37 per cent managed 500 metres outdoors. Outdoors crutch walking was frequently out of the question due to unfavourable climatic conditions such as deep snow and icy surfaces.

Table III shows the duration of the training period in weeks for the 32 patients who managed 20 stairs with crutches. All the clients succeeded within 32 weeks, the average being 10-18 weeks depending primarily upon the level of the lesion. The main reasons for unsuccessful training for the remaining 12 patients were as follows: heterotopic ossification of hip, 4; not motivated (too old), 3; hemiplegia, 2; decubitus, 2; and alcoholism, 1.

Discussion

We have encountered a relative high incidence (37 per cent) of heterotopic ossification (Bramness & Natvig, 1975), but we do not attribute this to our physical training programme since many of the clients were afflicted prior to admission. Other authors have reported even higher incidences (Damanski, 1961; Venier & Ditunno, 1971). In a few cases it has been necessary to perform Achilles and Adductor tenotomies because of undesirable spasms in the lower limb. We have encountered only a few cases of lower limb fractures, but not as a result of the physical training programme. One would expect to find a lesser degree of disuse osteoporosis in our clients. We have not investigated this in our series, but Guttman (1973) states: 'As soon as the paraplegic is up in his wheelchair, intensive physiotherapy including standing and in particular sporting activities have been invaluable in combating osteoporosis.'

Conclusion

A 10-year follow-up study of 42 paraplegics with complete lesions (T₁-L₃) has shown that 74 per cent were able to climb 20 stairs with crutches and 71 per cent could walk 100 metres indoors after completion of physical training. We believe it to be beneficial for the paraplegics to maintain the erect posture and to use their crutches whenever and wherever possible. From the medical point of view one would expect less disuse osteoporosis, less decubitus ulcers and urinary tract infections. From the psychological point of view many clients claim that it is gratifying to be able to stand and 'look a man straight in the eye'. Vocationally, we have found it to be easier to recommend a paraplegic to a prospective employer when the client is able to climb all kinds of stairs and when he has attained a relatively high degree of physical independence and dexterity with crutches.

RÉSUMÉ

Les auteurs rapportent les principales caractéristiques du programme de réhabilitation physique des paraplegiques appliqué au Centre de readaptation professionnelle d'Oslo. Ils présentent le bilan, après 10 ans, de 42 patients porteurs de lésions de T₁-L₃. Après un programme de readaptation physique intensif de 10 à 15 semaines, 74 % des patients étaient capable de monter 20 marches d'un escalier ordinaire, et 71 % de marcher 100 mètres à l'intérieur, avec des béquilles. Les auteurs soulignent l'importance du déplacement indépendant, sans fauteuil roulant, quand cela est possible.

ZUSAMMENFASSUNG

Einige hervortretende Züge am physischen Trainingsprogramm für Querschnittgelähmte im Staatlichen Rehabilitierungsinstitut in Oslo sind erwähnt. Eine zehnjährige Studie von 42 Patienten mit kompletten Läsionen (T₁-L₃) ist präsentiert. Nach einem intensiven physischen Trainingsprogramm das etwa 10-15 Wochen dauert, waren 74 % fähig, 20 Standard Stufen aufzuklettern and abzugehen. 71 % waren fähig auf Krücken 100 Meter im Hause zu gehen. Die Verfasser betonen die Bedeutung von Verkehr ohne Rollstuhl, wenn das möglich ist.

REFERENCES

- BRAMNESS, G. & NATVIG, H. (1975). Heterotopic ossification in spinal cord lesions. *T. Norske Lægeforen*, **27**, 1522-1525.
- DAMANSKI, M. (1961). Heterotopic ossification in paraplegia. A clinical study. *J. Bone Joint Surg.*, **43B**, 286-299.
- GUTTMANN, L. (1973). *Spinal Cord Injuries: Comprehensive Management and Research*, p. 205. Blackwell Scientific Publications, Oxford.
- HARDY, A. G. (1957). Report of the survey of paraplegic mineworkers. Coal Industry Social Welfare Organisation.
- KAASA, L. & MCADAM, R. (1967). A survey on the rehabilitation of paraplegics. The State Rehabilitation Institute in Oslo.
- MCADAM, R. (1973). Bladder training. *T. Norske Lægeforen*, **33**, 83-84.
- VENIER, L. H. & DITUNNO, J. F., JR, (1971). Heterotopic ossification in the paraplegic patient. *Arch. Phys. Med. Rehabil.*, **52**, 475-479.