Prosthetics and Orthotics International, 1998, 22, 251–253

Clinical note

Rehabilitation of a triple amputee including a hip disarticulation

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Abstract

A multiple amputee more severe than a triple amputee is uncommon. There have been no reports on the rehabilitation outcome of a triple amputee, including hip disarticulation and trans-tibial amputation. The authors report the rehabilitation of a patient with left hip disarticulation, right trans-tibial amputation, and left trans-humeral amputation due to a train accident. He has successfully completed the rehabilitation programme and has become independent in prosthetic ambulation, activities of daily living, and driving.

Introduction

There have been few reports on the rehabilitation outcome of a multiple amputee more severe than a triple amputee (Kitowski and Leavitt, 1968; Laatsch *et al.*, 1993; Shaw *et al.*, 1977). There have been no reports on the rehabilitation outcome of a triple amputee, including a hip disarticulation and trans-tibial amputation. Multiple limb loss requires more motivation from the amputee to overcome the disability, and more cooperation and active management from the rehabilitation team to make the rehabilitation process a success. The authors treated a case where the patient underwent left hip disarticulation (HD), right trans-tibial (TT) amputation, and left trans-humeral (TH) amputation surgery secondary to a train accident. He successfully completed his rehabilitation programme to become independent in all activities of daily living, prosthetic ambulation, and driving.

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Case report

A 37-year-old man sustained multiple and severe injuries in a train accident on December 7, 1996, which resulted in left hip amputation, left forearm amputation, and multiple comminuted fractures of the right leg. In a local hospital in Seoul, Korea, he underwent a left HD, left TH amputation, and right TT amputation, and was then transferred to the Rehabilitation Hospital, Yonsei University College of Medicine, on March 15, 1997, three months after the accident.

Physical examination performed on admission revealed the left TH stump length from the acromion to be 16 cm (55%), and the right TT stump length from the medial tibial plateau to be 12 cm. The soft tissue shrinkage of the stumps was found to be relatively good, except for the left HD which showed incomplete shrinkage (Fig. 1). Muscle power of the left forearm and the right leg were slightly reduced to Grade 4 (Grade 5 being normal). On functional examination, the patient was found to be barely able to eat and wash his face independently. He could turn on his side and sit, however his balance was reduced to fair and the endurance time was 5 minutes. The X-rays did not show any bony spurs, but there was 30° angulation of the right femur shaft secondary to an old right hip fracture sustained in another accident in 1974.

After admission, his preprosthetic training began with muscle strengthening exercises including Cybex isokinetic training, stretching exercises to maintain a normal range of motion, and exercises to improve balancing ability. On April 10, 1997, the left TH prosthesis with

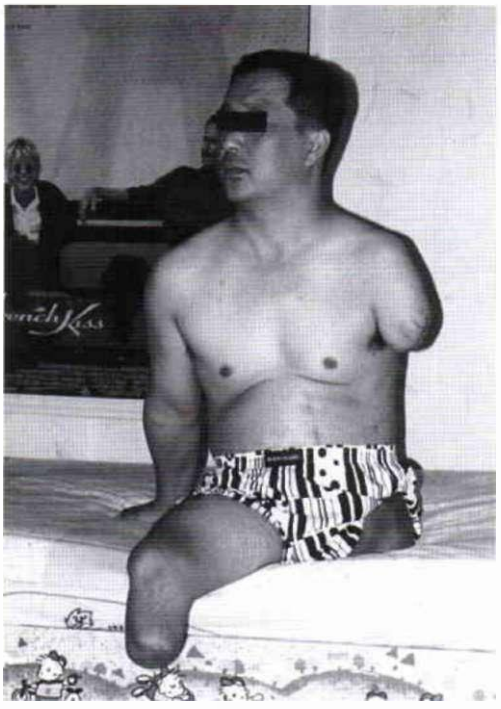

Fig. 1. Sitting without prothesis.

standard figure-of-eight harness, Hosmer elbow unit, wrist unit of friction type, and Dorrance 8 hook was fitted. On April 15, 1997, the right TT prosthesis with a patellar-tendon-bearing (PTB) socket, cuff suspension connected with fork strap, endoskeletal shank and dynamic response foot and the left HD prosthesis with a Canadian socket, waist belt suspension, endoskeletal shank, polycentric knee joint, and dynamic response foot were fitted. The length of the prosthesis for the right lower limb was designed to be 3cm shorter than the length prior to the accident for improved stability, and the prosthesis for the left HD was designed 1cm shorter than the right side for toe clearance.

After 2 weeks of standing and weight bearing training, the patient started to practice gait training with parallel bars and progressed to gait training with a unilateral quadripod cane on a flat floor by 4 weeks. After 6 weeks, he started training on a ramp and stairs. After 8 weeks of training, he became independent in all activities of daily living including donning and doffing of his protheses. He was able to walk about 100m, ascend and descend stairs, and climb a ramp with a quadripod cane, all independently (Fig. 2). He acquired his driver's license after 2 weeks of driving practice with right TT prosthesis with a PTB socket, epicondyle suspension, exoskeletal shank, and SACH foot especially designed for driving.

Evaluation of his home revealed the need for several changes to facilitate his independence even without the aid of prostheses. He was unable to move into the bathtub for a shower and transfer onto the toilet without prostheses. A metal plate was specially designed to be fixed above his bathtub for showers, and portable wooden stairs were designed to facilitate transfers from the floor into the bathtub or onto the toilet seat. This allowed him to take showers and use toilet independently without prostheses. A specially designed tray with wheels was made to facilitate indoor transfers without prostheses. He practiced using an electric scooter in order to make transfers possible from his apartment to the parking lot or to nearby stores with the prostheses on. At the end of the rehabilitation programme, on June 19, 1997, he became independent in all activities of daily living including ambulation with or without protheses as well as driving.

Discussion

There have been only a few reports on the rehabilitation outcome of multiple major

Fig. 2. Standing with prostheses.

amputees. Kitowski and Leavitt (1968) reported the rehabilitation outcome of a quadruple amputee with bilateral TT and bilateral trans-radial amputations secondary to an electrical burn. Laatsch *et al.* (1993) reported the countertransference in rehabilitation of a quadruple amputee with bilateral TT amputation and bilateral shoulder disarticulations. Shaw *et al.* (1977) reported on the psychosocial problems in rehabilitation of a patient with triple amputations including right wrist disarticulation, right trans-femoral (TF) amputation, and left ankle disarticulation amputation, as well as another patient with bilateral TH amputations and left TF amputation. The patient described in this report involves three major triple amputations including a hip disarticulation and a 30° angulated femur on the better of the two legs with TT amputation. The authors found that a more thoughtful and creative rehabilitation strategy considering the patient's physical and environmental conditions, and closer cooperation among the rehabilitation team are necessary to obtain a good functional rehabilitation outcome for a patient with multiple amputations. From this perspective, a rehabilitation team consisting of physiatrists, a prosthesist, a physical therapist, an occupational therapist, a physchologist, a social worker, and rehabilitation nurses worked closely together and held weekly team meetings.

The tray with wheels for home transfers without the aid of prostheses, the metal plate installed above the bathtub for showers, and the portable stairs for transfers from the floor into the bathtub and onto the toilet were vital pieces of modified equipment that were devised after evaluation of the patient's apartment. The electric scooter was used instead of a wheelchair for short distance outdoor transfers, which was also very satisfactory in view of energy conservation. The right TT prosthesis which was fitted solely for driving, made driving possible with minimal difficulties and without any modification to a car.

Shaw *et al.* (1977) in their report on the successful rehabilitation of two triple amputees proposed that the more important factors of obtaining full physical independence are early prosthetic fitting and training, as well as prompt recognition of psychosocial needs. The authors believe the patient's confidence and positive attitude toward a successful rehabilitation outcome are more important than any other factors, including early prosthestic fitting and training. In the beginning of the programme the patient showed a complete lack of confidence in his rehabilitation outcome. At the time, he was barely able to sit independently and the ability to stand with prostheses on was the best he could hope for. His progress was slow in the beginning and he even showed mild depression. However, as his endurance and balance in independent standing improved, his confidence also grew and, as a consequence, his motivation was reinforced. His progress became more and more rapid. The authors believe training with spinal cord-injured patients and stroke patients in the rehabilitation hospital helped him accept his disability, and to gain confidence and motivation for his rehabilitation.

One of the worries after the patient's discharge was that he might not use his prostheses often because he had become independent in all activities of daily living and indoor transfers without them. However, the assessment 3 months after discharge from the hospital assured the authors that he was using his prostheses regularly. Luckily for him, he neither had any financial nor any family problems. However, unfortunately, he still has not found a job and it is not very likely that he will find one soon as the opportunities for the disabled in Korean society are not yet bright.

As described, a patient with left HD, right TT amputation and left TH amputation secondary to a train accident became capable of performing all activities of daily living, walking, and driving independently following rehabilitation. For the successful rehabilitation outcome of a multiple major amputee, motivation and close cooperation between the patient and the rehabilitation team are necessary. Furthermore, creative consideration of the patient's functional, environmental and social disability is highly appreciated.

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