

Challenges Faced in Rehabilitation of a Person with Quadruple Amputation Following Electrocution- A Case Report

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ABSTRACT

Case description and objective: This article describes the challenges faced in the rehabilitation of a person with quadruple amputation, the pre-prosthetic difficulties faced and subsequent functional improvement after prosthetic fitting and training.

Study Design: Case report

Treatment: The rehabilitation program was started with pre-prosthetic phase, comprising of physical and mental adaptation to the condition with necessary interdepartmental support with stump preparation, and then progressed to prosthetic phase, in which the patient was fitted and trained with mechanical prostheses.

Outcomes: The patient graduated from being wheelchair bound to independent ambulation without any mobility aid using all four extremities prostheses successfully.

Conclusion: The successful rehabilitation of a person with quadruple amputation with mechanical prostheses is a challenge. But with prior motivation, planned progressive training and psychosocial counselling, it can serve as an example to help such cases in a low socioeconomic country like India.

Key Words: quadruple amputation, amputation rehabilitation, electrocution, prosthesis

INTRODUCTION

Amputations are pretty common in India, mostly due to Road Traffic Accident (RTA) in young population and Diabetes in elderly. Multiple limb amputations are relatively sparse and quadruple amputation cases are extremely rare. There is very little published literature regarding rehabilitation of a case of quadruple amputee.^{1,2}

In cases of lower extremity amputations, rehabilitation is mainly focussed on gait training and balance; whereas in cases of upper limb amputations, Activities of daily living (ADL) training is more emphasized. Lower limb amputation usually makes the patient wheelchair bound

and later on dependent on crutches or walker, which results in weakening of the trunk and core muscles. Regaining the trunk strength and balance before prosthetic fitting is a priority in these cases. In contrast for upper limbs, the function lost is the patient's ability to do most of his basic ADLs like eating, bathing, grooming etc. So when both are present in one case, it becomes a challenge as training is required in multiple aspects in the same patient, along with maintaining the emotional state and morale of the patient. So for the program to succeed, we need a comprehensive approach along with involvement of other disciplines of medicine.

The patient's physical abilities, with socioeconomic standing are also to be factored in, especially in a developing country. The patient's expectation should be understood and the program should be explained to him/her and inputs incorporated accordingly. In this case report, we have gone about by initially getting the patient comfortable with his body image and basic ambulation with wheelchair, followed by training of upper limbs for adapted ADLs. Once the wound were healed the fittings of prostheses were done with the goal of donning and doffing of the prostheses with minimal assistance. Necessary gait and balance training was initiated along with handling techniques for upper limb prostheses. Suitable ambulatory aids were provided to reduce dependency on caregivers as much as possible. Hence, we report successful rehabilitation of a person with quadruple amputation in this paper.

CASE DESCRIPTION

A 23-year boy from nearby town presented with a history of electrocution while attending to an onsite electric complaint, on 11th January 2018 to the Emergency Room of Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India. On examination, there was an entry and exit wound in bilateral upper limbs and lower limbs, respectively. Peripheral pulses were not palpable, compartment syndrome was diagnosed, and fasciotomy was done 2 days later. On check dressing, non-viability of all four limbs was detected and Guillotine amputation was done. He underwent wound healing process and thereafter, he was referred to the Physical Medicine and Rehabilitation (PMR) Department after a period of more than 3 months for rehabilitation.

An informed and written consent was obtained from him before documenting his case for research purpose. On presentation, he was found to have Bilateral (B/L) transtibial and transradial amputations. B/L elbow Range of Motion

(ROM) was 0-30 degree and B/L knee ROM was normal. The lower limb stumps length were 12 cm and 14 cm on left and right side respectively. The patient was totally dependent for his ADL.

TREATMENT:

The patient was started on stretching exercises for B/L elbow, Active ROM and strengthening for all 4 limbs especially for B/L quadriceps, hip extensors and abductors, pre-prosthetic training, stump care by physical therapist and Activities of Daily Living (ADL) training along with wheelchair mobilisation training and counselling by occupational therapist. He was registered for B/L transradial and B/L transtibial prosthesis and sent home.

The patient had already been evaluated by the psychiatry department and was diagnosed to be having post-traumatic stress disorder. The patient was prescribed antidepressant medications which he continued for 3 months post-op. He was also given counselling. Losing all of his limbs put him in denial in the beginning and on acceptance of his state; he went through social anxiety disorder. But, with regular psychiatric treatment and counselling, he accepted his situation and worked on a healthy body image and was motivated for prosthetic management.

The patient came for first follow up in the outpatient department of Physical Medicine and Rehabilitation (PMR) around 4 months after the accident. All the stumps had healed by then. ([Pic. 1](#)) He was advised to continue pre-prosthetic exercises and adaptive ADL training on a home-based program. He was given ADL training using universal cuff. He was also started on aerobic training to improve the lung capacity and oxygen consumption anticipating the increased energy expenditure the patient was going to have on starting with the prostheses.

He was admitted as inpatient after a period of 6 months later for prosthetic fitting and checkout. There were no stump complications like neuroma, phantom pain, skin breakdown, etc. present on

readmission. The patient had full ROM of hips, knees, shoulders and elbows following home-based exercise program. He was then started on gait and balance training on bilateral transtibial prostheses.



Pic 1: Pre-prosthetic fitting stage



Pic 2: Lower limb Prostheses

The transtibial prostheses were patellar tendon bearing, body powered, had self-suspension type socket, endoskeletal body, Static ankle joint and Ranger foot (modified SACH foot). (Pic 2) The transradial prostheses were body powered, harness suspended, with quick disconnect wrist unit and prosthetic hook as terminal device with control cables. (Pic 3) All the prostheses were provided to the patient free of cost and the entire cost was borne by the government institute.



Pic 3: Upper Limb Prostheses

OUTCOMES:

Table 1: Improvement in ADL

	FIRST PRESENTATION (19 th April, 2018)	DISCHARGE (4 th January, 2019)
FIM – Functional Independence Measure		
Self-care	5	24
Sphincter control	14	14
Transfers (mobility)	3	17
Locomotion	2	9
Communication	14	14
Social cognition	21	21
Total	59	99

The patient reported to us after 3 months of prosthesis fitting and training for follow-up. (Pic 4) At that time, he was very

satisfied, happy and walking independently without any aid. He was also highly motivated.



Pic 4: Post prosthetic fitting follow up stage

DISCUSSION

Amputation rehabilitation itself is quite challenging and difficult to proceed with; needing a multidisciplinary action. Quadruple amputation being a rare occurrence, resulted in a very limited number of studies or case reports detailing a rehabilitation approach. There is no internationally accepted uniform guideline regarding management of such patients. For it to be successful, we needed a comprehensive rehabilitation program with stepwise handling of the problems the patient might face in gaining mobility and going about his basic ADLs. Kitowski and Leavitt¹ reported successful rehabilitation of a person with quadruple amputation by following a systematic approach.

As the patient in our case report was a healthy and fit young man, well-motivated; it contributed to his success with the prostheses and the entire rehabilitation process. Lower functionality has been noted in elderly patients.⁵

Self-donning and doffing of the lower limb prostheses and upper limb prostheses with minimal assistance, along with independent ambulation were the goals of rehabilitation in this case. They were achieved after systematically dealing with the problems arising in the rehabilitation pathway and adapting with the limitations. Previous literature mentions a lone case that was successful with putting on the prostheses independently.² Rest all needed some form of assistance.⁴

Independent indoor ambulation was achieved, with intermittent use of bilateral forearm crutches. Proper wheelchair training was provided for outdoor locomotion. Previous studies have shown the importance of psychosocial and family support in the outcome of amputation management.^{3,6,7,8} In this case, we ensured proper family counselling, parental support and regular motivation to the patient. The psychiatry department was kept in loop from the very beginning including evaluation and follow-ups. These helped the patient in rapid adaptation to his condition and developing a positive body image.

With the use of prostheses, the energy consumption also increases. Usually, a person with bilateral transtibial amputation consumes approximately 40 to 120 percent more energy per unit distance than a normal person.^{9,10} So, to improve the oxygen reserve in this case, pulmonary rehabilitation was also provided.

The previous literature which are available on this subject in limited numbers, describe rehabilitation with myoelectric and advanced prostheses and only one case has been described using conventional body-powered prostheses. In our case, because of our country being a low-resource setting and the patient from poor socio-economic background, it was not feasible to provide him with expensive prostheses. In this case, we were able to successfully rehabilitate a person with quadruple amputation.

CONCLUSION

We have reported fitting of prostheses of a person with quadruple amputation along with successful ambulation and training of basic ADLs. The key factors in this accomplishment were the patient's age, fitness, motivation, parental support and a multidisciplinary involvement.

Conflict of Interest:

No potential conflict of interest relevant to this article was reported.

Limitations of the Study

We could not evaluate the case in long term follow-up, as he didn't survive more than 3 months after the prostheses fitting. This patient had already registered for bilateral forearm transplantation in Plastic surgery department before attending our department. He underwent bilateral forearm transplantation in the month of April 2019, but unfortunately, he succumbed to graft rejection reaction.

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