

Rehabilitation of Geriatric Burn Patient Post-Meek Micrograft with Bilateral Partial Calcanectomy: A Case Report

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ABSTRACT

Looking along the physiological and physical changes in aging, in the light of a major burn, co-morbidities, surgical intervention and precaution, a geriatric burn patient requires a delicate balance of ideal burn care and rehabilitation to achieve functional independence. A 70-year-old patient, with 30% total body surface area flame burn injury, underwent bilateral partial calcanectomy secondary to calcaneus osteomyelitis, and Meek micrograft technique for burn injury on bilateral lower extremities, is presented in this case report. In order to ensure good graft take, her knees were immobilized causing bilateral soft tissue contractures. Subsequently, upon initiation of ambulation, gait abnormalities observed include absence of heel off and toe off, with heel walking. The patient was admitted for intensive inpatient rehabilitation, where significant improvement in the knee range of motion and ambulation were achieved. The patient was eventually discharged ambulatory with walker. Despite expected complications, rehabilitation management proved to be beneficial in improving function and ambulation in geriatric burn patient.

Keywords: calcanectomy, Meek micrograft technique, burn rehabilitation

INTRODUCTION

Major burns often lead to long lasting impairment and disabilities. Early initiation of rehabilitation is vital to ensure prevention of complications of physical inactivity, thereby shortens length of hospital stay, and improves physical function, quality of life, and general outlook among survivors.¹ However, clinicians should always consider an individualized management, especially in a geriatric patient with co-morbidities. Aside from medical complications, physicians should consider physiologic and functional changes which affects recovery from burn injuries.

This case report highlights the rehabilitation of a geriatric burn patient, the challenges met due to the complexity of the condition and the learning points in handling such a unique case. Likewise, it discusses the balance between achieving ideal burn care and rehabilitation amidst the presenting co-morbidities and surgical precautions.

CASE DESCRIPTION

This is a case of a 70-year-old female who sustained flame burn injuries 30% total body surface area (18% superficial partial thickness burn on bilateral upper and lower extremities, and 12% deep partial thickness burn on bilateral lower extremity). She was immediately brought to a local hospital where manual debridement and application of silver dressing was done and eventually discharged. One month



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post injury, on regular check-up, there was noted infection of her burn wounds over the bilateral calcaneal area, hence transferred to the Philippine General Hospital (PGH), a main referral center for patients coming from the different regions of the country, for specialized burn care.

While at PGH, the patient underwent the following surgical procedures: bilateral partial calcaneotomy and extraarticular calcaneus-tibial Steinmann pin stabilization, resulting to absent posterior aspect of the calcaneus where only sitting with legs dangling was allowed. Subsequently, burn rehabilitation was initiated. The rehabilitation program for the upper and lower extremities included: 1) flexibility training; 2) strengthening of quadricep muscles using straight leg raises; 3) bed mobility exercises; 4) fine motor skill training and grip strength exercises; and 5) anxiety assessment and management. At three months of admission, split thickness skin grafting using Meek micrograft technique (Figure 1A) was done on bilateral popliteal area immobilizing the legs (Figure 1B) for one month to ensure good graft take.

Upon clearance for mobilization, re-evaluation revealed erythematous to hyperpigmented, non-tender, epithelizing burn wounds on the posterior thigh and lower leg, presence of active right calcaneal wound, atrophy of bilateral lower extremity muscles and contracted knees, with limited knee flexion of 0 - 20°, and absent active plantarflexion. Transfer

to the Subacute Burn (SAB) unit of Rehabilitation Medicine Ward was done on the fourth month of admission to undergo a comprehensive and intensive burn rehabilitation focusing on strengthening of the lower extremities, mobilization of the knees, and ambulation.

Burn rehabilitation program consisted of: 1) physical therapy, focusing on mobilization of both knees using Continuous Passive Motion equipment, strengthening of lower extremity, and ambulation (Figures 2A and 2B); 2) occupational therapy, focusing on standing activities and weight bearing tolerance (Figure 2C); 3) nutritional upbuilding, consisting of increase in protein intake; and 4) psychology, providing patient and caregiver counselling and motivation to participate in therapy sessions. Within two weeks' time, the patient showed significant improvement and was able to ambulate with a standard walker. There was noted improvement of the range of motion of her knees (Appendix A) and improvement of strength of the bilateral lower extremities (Appendix B), achieving independence on transition and ambulation using walker. However, the patient was noted to do heel walking on all surfaces. There was absence of heel off and toe off. When walking on level surface, patient would initiate swing phase from 30° and 40° on the left and right knee flexion, respectively. While going down on an incline surface, the patient could stand



Figure 1. (A) Post-Meek micrograft split thickness skin micrograft on the popliteal and medial knee. Inset: Focused image of Meek micrograft. (B) Bilateral knee immobilized.

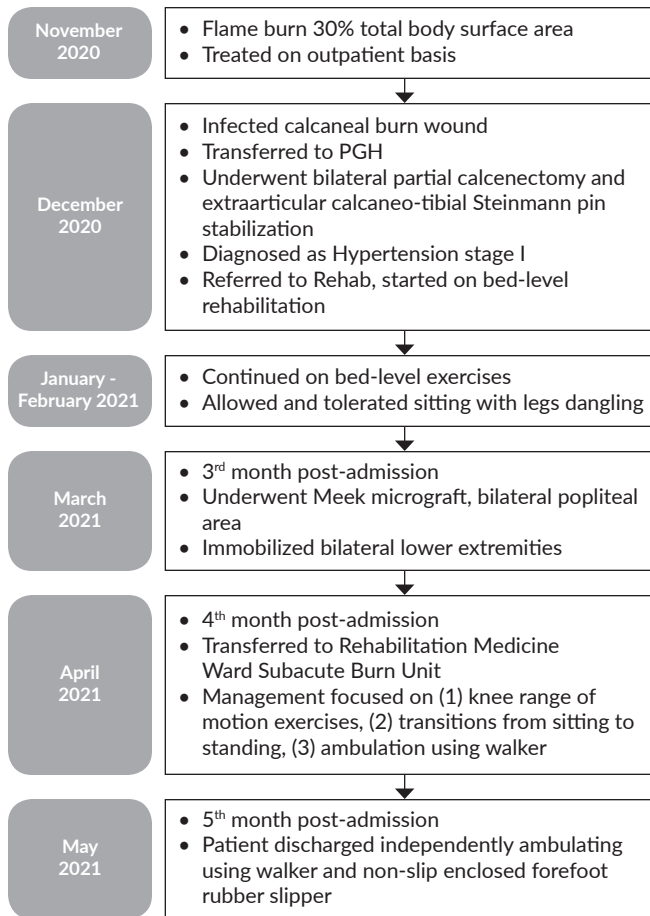


Figure 3. Timeline of patient’s history, functional capacity, and management.

upright while walking. In contrast, the patient was observed to increase her hip flexion to 45 degrees when going up an incline surface. The knee flexion was increased from neutral to 40° on the left and 80° on the right during swing phase. Despite these gait changes, the patient continued on with strengthening, endurance and gait training.

By the fifth month of admission, two months of burn care and rehabilitation, the patient was eventually discharged using a non-slip enclosed forefoot rubber slipper, and ambulating independently using a walker. Figure 3 summarizes the patient’s history, functional capacity, and management.

DISCUSSION

The older adults are prone to burn injuries as the aging process is associated with multitude of age-related physiologic decline and physical changes. Even after discharge, functional outcomes and quality of life are compromised compared to the younger population.² Elderly patients admitted in Acute Burn Units have been shown to have higher mortality and morbidity rates, increased risks of medical complications, slower recovery rates, prolonged hospital stay, higher health service expenditure, and worse physical and emotional suffering.³

Complication of burn includes infection, such as calcaneus osteomyelitis. In burn patients, osteomyelitis occurs after exposure of musculoskeletal structures in deep partial thickness and full thickness burns. Treatment goals for calcaneus osteomyelitis include infection eradication while maximizing lower extremity function.⁴ Partial calcaneotomy

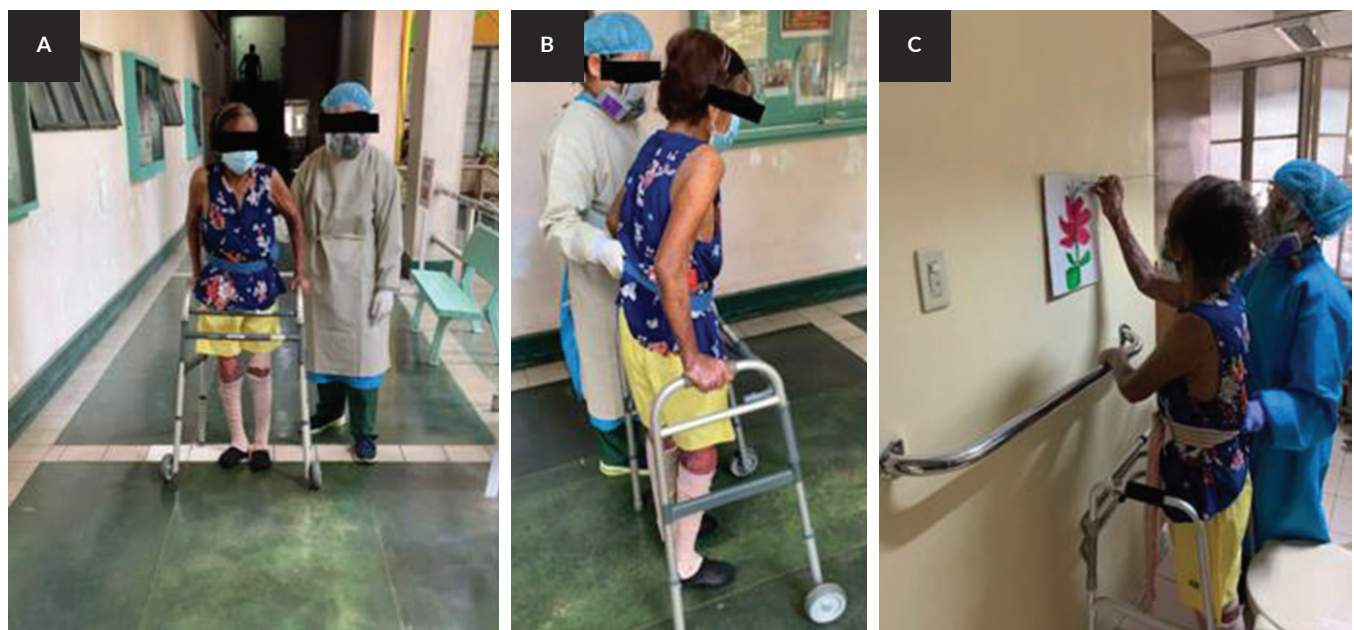


Figure 2. (A, B) Patient was able to ambulate for 20 meters using a rollator walker. (C) Patient was able to do standing activities such as painting during Occupational Therapy sessions.

has been used recently as a limb salvage treatment for calcaneus osteomyelitis. Patients who underwent this surgery had better functional outcomes compared to amputation. While unilateral calcaneotomy has shown good results in terms of recovery of function, bilateral calcaneotomy is rarely performed. The procedure decreases the motor strength of the posterior compartment muscles, but this becomes negligible when prescribed with ankle-foot orthoses (AFO) providing stability to the ankle complex.⁵

In planning for the orthotic device to aid in ambulation, the absence of attachment of ankle plantarflexors will also alter the kinematics of gait. The calcaneus bears 50% of body weight during standing, and heel strike to midstance during walking.⁶ Calcaneal abduction and eversion initiates stance phase, while adduction and inversion progresses the foot to midstance.⁷ While the absence of Achilles tendon attachment may have changed such conditions, the patient was able to negotiate ramps without orthotic device.

The altered anatomy of the foot given the partial absence of the bilateral calcaneus combined with severe muscle wasting pose a challenge in providing the appropriate shoe modification for ambulation purpose. However, fitting of shoe modification did not materialize due to development of blister on the bilateral heel. Ambulation using a non-slip rubber footwear and walker was deemed to be a cost-effective and safe for the patient.

While mobilization could have prevented bilateral knee contracture in our patient, Meek micrograft was done on the posteromedial leg, which required placing both her legs in a cast.⁸ Despite this circumstance, early rehabilitation was initiated in order to prevent complications of immobility. Early rehabilitation in geriatric burn patients is crucial in mitigating complications, reducing duration of hospital stay, improving over-all strength, maximizing functional outcome, and quality of life.⁹ Bedside exercises, such as straight leg raises, were essential in promoting strengthening of the quadriceps muscles, improving pain control, and promoting better functional recovery over time.

While limitation of function was expected given the complicated situation and anticipated physiological decline among elderly patients, exercise and rehabilitation management proved to be beneficial in the patient's return to ambulation. Exercises, such as resistance training, delay sarcopenia and improves over-all strength. In terms of ambulation, elderly patients who engage in physical activity have shown improvements in gait speed and power, and prevention of falls.¹⁰ Therefore, despite complications that may be present in geriatric burn survivors, it is imperative that rehabilitation management should commence early improving one's function and quality of life.

Patient's Perspective

The patient was very much receptive to her therapy throughout the course of her admission and upon discharge. Being admitted for four months with most of the time

immobilized due to skin graft precautions, she was optimistic throughout the therapy sessions and has been following the home instructions given to her. She has been independently ambulatory at her home and grateful for the improvements that her rehabilitation management has done for her.

CONCLUSION

This case report highlights early intervention and rehabilitation assessment in the management of a geriatric burn patient who is vulnerable to complication of burn injury and multiple musculoskeletal issues. A carefully planned and focused burn care rehabilitation program attenuated the physical signs of normal aging and immobility, reversing a negative effect to an active elderly capable of performing activities of daily living with modified independence in ambulation.

Consent to Participate

The patient gave verbal and written consent in the writing and publication of this case report.

Statement of Authorship

All authors participated in the data collection and analysis, and approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

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APPENDICES

Appendix A. Range of motion of patient’s knee during her course of admission

	Pre-transfer to Rehab Ward	Rehab Ward Week 1	Rehab Ward Week 2
<i>Right</i>	0 - 20°	0 - 110°	0 - 120°
<i>Left</i>	0 - 20°	0 - 70°	0 - 90°

Appendix B. Motor strength of patient during her course of admission

Muscle groups	Pre-transfer to Rehab Ward		Rehab Ward Week 1		Rehab Ward Week 2	
	Left	Right	Left	Right	Left	Right
Hip						
Flexors (<i>Iliopsoas</i>)	4/5	4/5	5/5	5/5	5/5	5/5
Extensors (<i>Gluteus, hamstrings</i>)	4/5	4/5	5/5	5/5	5/5	5/5
Abductors (<i>Gluteus medius, Gluteus minimus, Tensor fascia latae</i>)	4/5	4/5	5/5	5/5	5/5	5/5
Adductors (<i>Adductor longus, minimi, brevis</i>)	4/5	4/5	5/5	5/5	5/5	5/5
Knee						
Flexors (<i>Hamstrings</i>)	3/5	3/5	4/5	4/5	5/5	5/5
Extensors (<i>Quadriceps femoris</i>)	3/5	3/5	4/5	4/5	5/5	5/5
Ankle						
Dorsiflexors (<i>Tibialis anterior</i>)	3/5	3/5	3/5	3/5	4/5	4/5
Plantarflexors (<i>Gastrosoleus</i>)	0/5	0/5	0/5	0/5	0/5	0/5