

Abstract

Disclosure(s): None

Setting: Inpatient Regional Rehabilitation Facility

Patient: 39 year-old man with bilateral transradial and transtibial amputations.

Case Description: He developed Acute Myelogenous Leukemia 1 year prior and underwent chemotherapy. Neutropenia, gram-negative sepsis, hypotension and cardiac arrest ensued. Resuscitation required 4 vasopressors, with resultant ischemic limbs requiring amputation, all healing uneventfully. He was admitted for inpatient rehabilitation including amputee/prosthetic education, aerobic conditioning, aquatics therapy, gait training, psychological support, and continued medical monitoring. He improved in all areas of mobility, ambulation, and activities of daily living and was discharged home.

Assessment & Results: Initially, he used a power chair for mobility and was non-ambulatory and required mod/max assistance for transfers. His Functional Independence Measure (FIM™) score improved from 67 to 100, including donning and doffing his prostheses, becoming independent in most functional areas during a hospitalization lasting 6 weeks, including walking 150 feet using prostheses. He was able to swim greater than 1000 yards daily. He developed increased optimism regarding his future quality of life.

Discussion: Multiple limb loss secondary to sepsis and pressor support is a rare, catastrophic complication of chemotherapy. This patient had preserved cognition and developed appropriate grief reactions to his loss. With appropriate and timely intervention, he obtained optimal outcomes. Rigorous and comprehensive inpatient rehabilitation programs provide the opportunity to achieve functional independence, leading to a significantly improved perception of quality of life. Inpatient rehabilitation, rather than some lower level of care, allowed for critical coordination between the patient and his treating team necessary to enable rapid functional gains to an independent level, and to address his emotional needs.

Conclusion: Multiple limb amputations with coexistent life-threatening illness severely complicate the rehabilitation team's and patient's approach to rehabilitation, but outcome in selected patients can be excellent.

Key Words: Rehabilitation, Amputation, Quality of Life

Case

History of Present Illness

39 year-old AAM presented with constitutional symptoms & 20 pound weight loss over a 2 week period. Workup led to the diagnosis of acute myelogenous leukemia (AML), and he was treated with idarubicin & cytarabine. He became severely neutropenic & developed E. Coli & Enterococcus septicemia. Cardiac arrest & profound hypotension ensued, and he required maximum doses of four vasopressors which resulted in iatrogenic induced ischemic limbs. The time course from ischemia to dry gangrene was reported to be over a period of several days. Surgical consultation confirmed the need for bilateral transradial & transtibial amputation. After his acute care course was completed, he underwent a short rehab course for transfer and activity of daily living training. He was discharged to home, was lost to follow up and returned approximately one year later with well formed residual limbs and underwent prosthetic training, amputee education, aerobic conditioning, aquatics therapy, and psychological counseling in order to improve his functional independence along with improving his overall quality of life.

Past Medical History: Hypertension. **Past Surgical History:** None **Family History:** Asthma **Social History:** No Tobacco, Social Alcohol, No History of IV drug use. Lives with mother. Former assistant manager at auto dealership. **Allergies:** Heparin. **Medications:** Multivitamin, Prevacid, Neurontin, Prednisone, Norvasc, Colace. **Impairments:** cardiopulmonary deconditioning, generalized weakness, limited ROM, impaired balance, limb loss, impaired skin care, impaired mobility, aplastic anemia. **Activities:** decreased gait/mobility/transfer skills, decreased ability to take PO diet, care of domestic activities & necessities, daily life activities, use of assistive devices & related activities. **Participation:** inability to resume leisure activities, inability to resume role as family member, inability to return to independent living in community, inability to resume vocational activities, impaired personal maintenance, inability to access community resources.

Physical Exam:

V/S : BP 114/86 HR 86 RR 20 Temp 36.9

General: Awake, Alert, & Oriented. **HEENT:** normocephalic, No oral exudate; Trachea midline. **Heart:** regular rate and rhythm; no murmurs, rubs, gallops. **Lungs:** clear to auscultation bilaterally. **GI:** Abdomen Soft, nondistended, nontender; No rebound/guarding. **Extremities:** bilateral well formed transradial & transtibial amputations; Full Range of motion at knees and elbows (bilaterally). Non-tender, no signs of neuroma formation. **Skin:** surgical sites well healed; no erythema, no breakdown, no edema. **Neuro:** Cranial Nerves II-XII intact. No focal deficits. Manual muscle testing: 4+/5 Strength residual limbs bilaterally. Negative Tinel's sign bilaterally.

Clinical Course

The patient was admitted to acute rehabilitation. PT initiated upper extremity & lower extremity strengthening & ROM exercises along with an aerobic conditioning regimen consisting of daily aquatic therapy to build endurance. OT initiated education for modified independent techniques for activities of daily living & self-care including dressing, feeding, grooming/hygiene, and toileting. RT provided resource awareness via amputee education and support groups along with community reintegration. The prosthetics & orthotics team made final adjustments to his prostheses, and the patient was then ready to begin gait training. After a six week rehabilitation course, he had notable areas of improvement in functional independence and mobility. First, he was able to independently don & doff both upper extremity & lower extremity prostheses. Next, he became independent in his transfers & bed mobility. Then, gait training was instituted. He was educated on the increased energy demands of his gait, and he had conditioned himself via the preliminary aquatic and aerobics regimen. Initially, he ambulated with a platform walker which was modified for him to slide his UE prostheses through for additional support during sit to stand as well as during his gait. At the end of his six week inpatient rehabilitation course, he was able to ambulate without any assistive devices other than his LE prostheses. He was also able to go from sit to stand independently. He had gait analysis performed that revealed near normal gait pattern. His medical condition remained stable during his six week training, and the overall improvement in his functional independence made him more optimistic on his outlook on life. He was discharged to home with family as caregivers for additional support. His primary disease, AML, was in remission. The patient's **applicable FIM™ scores** at the start of his therapies were 15 for self-care, 7 for sphincter control, 9 for transfers, 1 for locomotion, 14 for communication, and 21 for social cognition. At discharge, his FIM™ scores had improved to 30 for self-care, 10 for sphincter control, 14 for transfers, and 11 for locomotion.

Discussion

When the basal tissue oxygen demand cannot be met by the peripheral vascular system, ischemic injury occurs in the tissues with the least blood supply with resulting necrosis and tissue destruction. Microvascular dysfunction secondary to a local and systemic inflammatory response worsens capillary blood flow. Treatment may include medications, revascularization or amputation.

Conservative approaches include a multi-modal strategy of anticoagulant therapy, surgery (usually embolectomy or bypass), or clot disruption. When conservative limb salvage measures fail, amputation will be necessary. Studies have shown that amputees who undergo a comprehensive inpatient rehabilitation program develop significant improvement in function often leading to full independence and an improved quality of life. This individual clearly benefited in functional independence and quality of life.

Conclusion

Despite the catastrophic events that led to amputation of 4 limbs, acute rehabilitation gave this patient the opportunity to effectively improve his functional independence and quality of life. Strengthening the residual limbs along with aerobic conditioning gave him an improved sense of self and this psychological seed sprouted his desire and pushed his will to continue a productive life. As this patient's rehabilitation course and amputee training continue to progress, he will be upgraded to other devices to further improve functionality and mobility.

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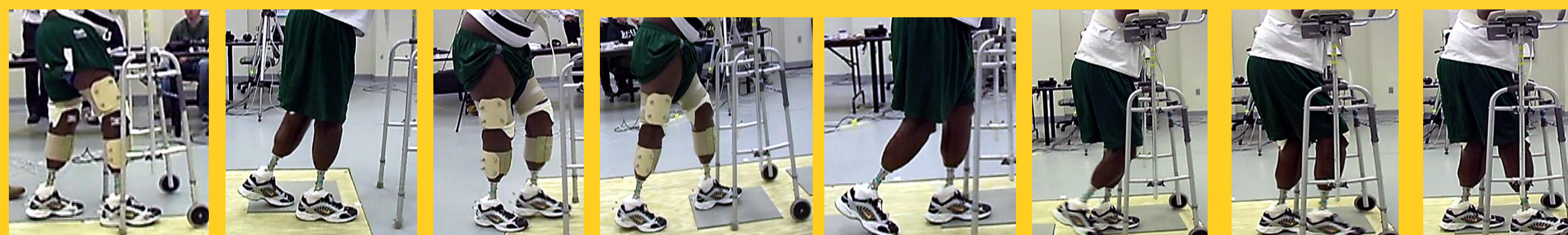
Introduction

Critical limb ischemia is defined as severe obstruction of the arteries with severely decreased blood flow to the extremities. It may present acutely in cases of external compression, distal embolization, or acute thrombosis. Chronic cases often present with pain (at rest) along with non-healing wounds, ulcers, or gangrene. Limb salvage may be attempted via revascularization procedures (surgical or percutaneous) aimed at improving blood flow.

In cases that result in limb amputation, the use of prosthetics, orthotics, assistive devices & adaptive equipment can improve functional independence thus leading to an improved quality of life. Since many types of prosthetics & orthotic devices exist, it is important to tailor them based on individual needs & goals.

The Patient was admitted for prosthetic training, and both his upper and lower extremity prostheses were suitable for this purpose. He required bilateral upper & lower extremity prostheses. His transradial upper extremity prostheses had voluntary opening terminal devices (body-powered), locking wrists with split sockets, flexible elbow hinges, tricep cuffs, composed in a figure 8 harness, and bowden control cable systems. The lower extremity prostheses had Patellar Tendon Bearing Sockets (PTBS) & pelite® liners, supracondylar suspensions, and endoskeletal shanks with a flexible keel foot.

2 Weeks:



Initial contact

Loading Response

Mid-stance

Terminal stance

Pre-Swing

Initial Swing

Mid-Swing

Terminal Swing

4 Weeks:



Initial contact

Loading Response

Mid-stance

Terminal stance

Pre-Swing

Initial Swing

Mid-Swing

Terminal Swing