Case Report

Hip Disarticulation in Wound Care

A Case Series

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Abstract

Background. Hip disarticulation (HD) is a radical lower extremity amputation performed by carefully transecting all muscles and nerves surrounding the hip joint and separating the leg at the joint capsule. It is considered a last resort to be used as a life-preserving measure under emergent circumstances due to high rates of morbidity and mortality.

Methods. This case series presents 4 patients who underwent HD. The procedure was performed due to various indications including necrotizing fasciitis, gangrene, stump necrosis from previous above-the-knee amputation, and septic joint secondary to chronic osteomyelitis, 3 of which were planned and 1 was emergent.

Results. The procedure was performed successfully in all 4 patients. Furthermore, all patients were eventually discharged to home or to a long-term care facility for wound care or rehabilitation.

Conclusions. Overall, HD should be reserved as a life-saving treatment for various indications including infections that fail other modalities, limb ischemia, trauma, and malignancy. Ideally, this procedure would be planned and performed on proper candidates; however, HD should still be a consideration in the emergent setting regardless of most optimal patients due to its life-saving potential.

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Introduction

Hip disarticulation (HD) is a radical amputation of the lower extremity performed by removing the head of the femur from its pelvic socket.[1] Given the high frequency of morbidity and mortality associated with HD,[2] this procedure is considered a last resort to be used as a life-preserving measure under critical circumstances. Indications for HD include necrotizing fasciitis, severe infection, trauma, ischemia, and malignancy. Of note, reports from the literature have indicated that the highest risk of mortality associated with HD includes emergency procedures[3] and HD performed in the settings of trauma and malignancy.[4] Emergency HD procedures have also been associated with a higher frequency of postoperative complications including flap failure, wound dehiscence, and further infection.[3] Concomitant peripheral vascular disease and prior above-knee amputations (AKA) have also been described as factors predisposing to complications.[3] These factors underscore the importance of proper wound debridement, management of infection and comorbidity, and hemodynamic stabilization in HD procedures.

This case series presents 4 patients who received HD in the hopes of contributing to the relatively sparse literature surrounding this radical procedure. HD was performed electively in 3 cases and urgently in 1. This article will outline the indications that lead to HD, management of comorbidities, and perioperative wound care measures that were taken in each case.

Methods

Case 1

A 72-year-old female with a history of uncontrolled diabetes was admitted to the hospital with sepsis due to severe necrotizing fasciitis of her left thigh and hip. Due to the severity of her condition and extent of her soft tissue necrosis, a guillotine amputation of the left hip was performed to remove the source of infection and

hasten the surgery. During the procedure, no healthy adjacent muscle was available to cover the exposed bony structures and a wound vacuum-assisted closure (VAC) was placed. The patient was resuscitated in the intensive care unit; she required intravenous antibiotics including vancomycin and Unasyn.

Case 2

The next patient is a 69-year-old male with a history of severe pulmonary disease and peripheral vascular disease as well as current smoking use status post failed femoral-popliteal bypass graft with left AKA. His surgical site failed to heal, and subsequently the necrosis extended proximally across his remaining stump and thigh. He was admitted to a long-term acute care hospital for wound care and rehab. Wound consult was obtained, and the patient was started on daily painting of the dry gangrene with betadine and was placed on a low air loss mattress. Nutrition support and rehab was also initiated. The dry gangrene contracted 2 weeks later, and his femoral bone became exposed. The patient was then taken to the operating room for left HD. During the procedure, a portion of the remaining hamstring muscle was used to obliterate the acetabular fossa and a lateral skin flap was used to close the wound over a drain.

Case 3

This case is a 63-year-old woman with an extensive medical history including coronary artery disease, hypertension, abdominal aortic aneurysm with repair, gastroesophageal reflux disease, uncontrolled type 2 diabetes (DM2), Buerger's disease, arterial insufficiency, deep vein thrombosis, severe peripheral vascular disease, status post left hip disarticulation, and a previous 80 pack-year smoking history. She also underwent a right extra-anatomical axillary-femoral bypass graft in 2008 for lower extremity ischemia. This maintained adequate blood supply to her right lower extremity for 10 years before she began experiencing severe pain.

Computed tomography angiography of the right lower extremity revealed right axillary-femoral graft occlusion and femoral artery occlusion with reconstitution of the popliteal artery due to collaterals and 2 vessel runoffs. This necessitated an AKA due to inability for revascularization and increasingly severe pain. A wound VAC was placed on the right AKA stump after wound dehiscence. However, a few days after her right AKA she developed increased duskiness and discoloration of the incision site; her right thigh became increasingly cool to the touch and exhibited significant pallor, and she reported ischemic right thigh pain. Due to these developments indicating stump necrosis, she underwent a right HD 4 days later.

Case 4

The final case is a 60-year-old paraplegic male with a past medical history of pulmonary disease and peripheral vascular disease status post left AKA, DM2, and chronic stage IV sacral and left ischial pressure ulcers with chronic osteomyelitis status post incision and drainage. The patient had established care at the wound clinic and was being treated with twice a day (bid) dressing changes using wet and moist 1/4–strength Dakin's solution with gauze. He was also prescribed intravenous vancomycin per the infectious disease team for osteomyelitis of

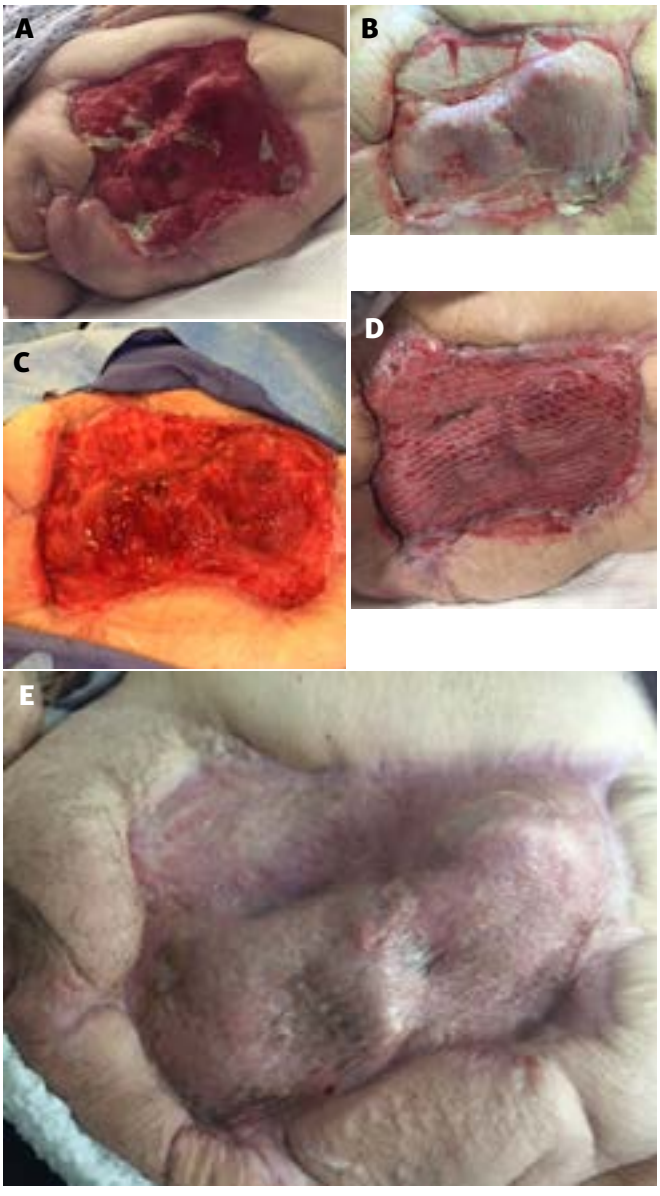

FIGURE 1. a) Wound bed with exposed acetabular fossa bone covered by granulation tissue with 20% fibrous/ligamentous tissue. b) Wound bed post debridement with subsequent application of HYAFF with negative pressure wound therapy 3 weeks later. c) Intraoperative view of the wound bed with 95% granulation tissue 3 weeks after debridement, HYAFF, and negative pressure wound therapy application. d) Meshed split-thickness skin graft placed on granulating wound bed with negative pressure wound therapy 1 week postoperative. e) Healed wound with 100% graft take 4 weeks postoperative.

FIGURE 2. a) Left AKA stump necrosis. b) Exposed femoral bone with dry gangrene. c) Skin flap showing partial ischemia at the incision site. d) Well-demarcated necrosis at the skin level with increased granulation tissue medially. e) Healing left hip wound with advancing epithelialization over healthy granulating wound bed.

the left hip. Due to a progressive fever, the patient was admitted to inpatient for treatment.

Computed tomography imaging at the time of presentation demonstrated left hip fluid collection consistent with septic arthritis of the left hip. Wound culture grew multidrug-resistant Acinetobacter baumani. The patient underwent left HD and excision of the proximal femur 3 days later. The left hip and pelvic defect were reconstructed with muscles and skin flaps over drains.

Results

Case 1

At 2weeks post operatively, the patient had become stable enough to be discharged to an extended care facility for continued intravenous antibiotics, wound care, and rehab. Wound consultation was requested at the ECF for possible wound coverage. The wound was covered with thin granulation tissue and 20% fibrous and ligamentous tissue and exposed acetabular bone **(Figure 1A)**. The patient underwent additional surgical debridement of the wound in the operating room and application of Hyalomatrix (eHAM; Medline, Mundelein, III) made of HYAFF (Medline), a hyaluronic acid–based matrix covered with a silicone layer **(Figure 1B)**, to invite more granulation tissue prior to skin grafting. The matrix was covered with the wound VAC at all times. The patient continued a high protein diet with physical and occupational therapy. Over 95% of her wound bed was covered with granulation tissue 3 weeks later **(Figure 1C)**. The patient then returned to the OR, and a meshed split-thickness skin graft was applied **(Figure 1D)** and secured with the wound VAC as a bolster dressing. The graft showed 100% take 4 weeks later, and the VAC was discontinued **(Figure 1E)**. At a follow-up appointment 3 months later, this patient was still doing well after having spent 3 months in a nursing home before being discharged to a rehabilitation facility.

Case 2

This patient's previous progressive stump necrosis **(Figure 2A)** leading to contracture and exposure of the femoral bone **(Figure 2B)** was successfully removed and halted with HD.The skin flap demonstrated partial ischemia at the incision site 1 week postoperatively **(Figure 2C)**. After wound dehiscence and demarcation was seen 1 month later **(Figure 2D)**, the patient received multiple debridements at bedside. Overall, the patient's wound was debrided 3 times over a period of 3 weeks and received bid dressing changes using quarter-strength Dakin's solution (sodium hypochlorite) wet to moist until the slough and eschar cleared **(Figure 2E)**. The patient was then switched to calcium alginate silver until the wound healed 6 weeks later. Recovery included physical therapy and occupational therapy for upper muscle strength and transfer from bed to wheelchair. The patient received follow-up care in a nursing care facility for 3 months until the wound was fully healed, and the patient was able to be discharged out of town to be closer to family.

FIGURE 3. a) Necrotic right hip stump. b) Intraoperative view of extensive muscle, subcutaneous tissue, and skin necrosis. c) Extensive debridement and closure with muscle and skin flaps over drain. Healing incisional line.

FIGURE 4. a) Intraoperative view of the patient in a right lateral decubitus position. Previous left AKA site with osteomyelitis of left femoral head due to septic joint. b) Intraoperative view of the left HD prior to closure. c) The acetabular fossa was obliterated with vastus lateralis muscle flap and skin flaps closure achieved over 2 drains. d) Healing and intact incision at 2-week postoperative visit.

Case 3

The procedure was successful; however, the patient developed necrotic right hip stump that required excisional debridement and exploration a little over 1 month later **(Figure 3A)**. The surgery included debridement of skin, subcutaneous tissue, and muscles that showed extensive necrosis **(Figure 3B)**. In addition, obliteration of the right acetabulum was performed with a vastus lateralis muscle flap along with complex closure over a drain. The patient received daily dressing changes to the incision until healed **(Figure 3C)** and was placed on a high-protein diet. The patient was eventually discharged home with home care from a long-term nursing care facility for rehabilitation and continued with follow-up as an outpatient in a satellite wound care center until the incision healed.

Case 4

HD was completed **(Figure 4A and 4B)**. The left hip and pelvic defect were reconstructed with muscles and skin flaps **(Figure 4C and 4D)**. On postoperative day 5, the patient remained afebrile, his incisions and flaps were intact, and he was discharged for follow-up in a wound clinic. All incisions were dry and clean 2 weeks postoperatively except for a 1-cm separation over the left ischium that was packed daily with Iodoform gauze. At 4 weeks postoperative, all incisions healed well except for a small open area at the tip of the flap that was about 1 cm deep. There were no signs of infection.

The patient presented to the emergency department 1 month later with 1 week of generalized weakness. He was admitted to inpatient treatment due to sepsis and protein calorie malnutrition. Subsequent labs showed leukocytosis, and urine culture showed evidence of a urinary tract infection for which antibiotic therapy was initiated. The slow-healing small posterior wound was being packed daily with Iodoform strip. The stage IV sacral pressure ulcer was being covered daily with calcium alginate silver and foam border dressing with some improvement. The patient continued to receive inpatient treatment for sepsis along with aggressive wound care and offloading, but unfortunately his condition continued to deteriorate. Two weeks later, care was withdrawn and the patient passed away.

Discussion

HD is a lower extremity amputation performed by carefully transecting all muscles and nerves surrounding the hip joint and separating the leg at the joint capsule.[5] The surgeon begins anterior to the patient and carefully transects the muscles of the anterior thigh off the pelvic bone while remaining below the superficial femoral vein to minimize bleeding before being ready to ligate. After completing the transection of the anterior section, the surgeon moves to the posterior side of the patient. In a similar fashion, the posterior muscles of the thigh are transected until the posterior joint capsule is exposed.[5] The joint is then transected followed by division of the sciatic nerve. The surgeon must also scrape the cartilage off the acetabular fossa and then obliterate it with a muscle flap such as the vastus lateralis. A drain must be inserted before the wound is closed. Wound drains are to remain until there is minimal output.

This procedure accounts for only 0.5% of all lower extremity amputations in the United States.[6] It is generally performed by orthopedic surgeons due to malignant tumors, trauma, and limb ischemia. The most frequent indication for HD is highly invasive tumors of the musculoskeletal system that do not allow for limb salvage such as sarcomas, chondrosarcomas, liposarcomas, and fibrous histiocytomas.[4] However, HD also has a role to play in severe lower extremity infections and nonhealing wounds including necrotizing fasciitis, septic arthritis, and stump necrosis.

There has been some debate on the associated mortality of HD by various indications. One study reported a 44% mortality following HD; however, the mortality rate varied greatly when grouped by procedure indication.[7] For example, the largest subgroup, the tumor-indicated group, had a 0% mortality, whereas the ischemia-indicated group had a 50% mortality rate. An additional study performed on 53 HD patients found an overall mortality rate of 21%, whereas the mortality rate for infection as the only indication in HD was 14%.[3] These studies show high mortality rates and all vary depending on indications. However, other HD analyses have shown mortality rates as low as 0 to 7%.[6,8] Colosimo et al[2] describe a "damage control" approach to HD in which debridement of necrotic tissue, source control, management of sepsis and hemodynamic instability, and ultimately patient stabilization are prioritized as a prerequisite to the HD procedure. In a small sample of 9 patients, the authors observed a mortality rate of 0%, and 66.67% of patients were able to transfer to a wheelchair at discharge or follow-up. There is conflicting evidence on mortality in HD in these small sample size analyses. Larger studies are needed to determine a more accurate risk assessment and to obtain greater insight into the best indications for HD.

HD is unfortunately associated with severe disability and pain. Most patients end up nonambulatory due to a large increase in energy expenditure when walking with a prosthesis. Nowroozi et al determined that it takes 82% more energy for HD amputees to walk when compared with ambulating with both lower limbs.[9] Furthermore, a study of 14 HD patients found that only 6 were successfully able to use a prosthetic.[10] Another study of 63 HD procedures found various outcomes with prostheses based on surgical indication. Denes et al found that 100% of patients with HD performed due to malignancy were ambulatory with a prosthetic, whereas only 5% of patients with vascular pathology could walk with a prosthetic.[11] Becoming nonambulatory has significant negative impacts on quality of life and independence.

Despite the challenges and variables associated with prosthetics, recent case reports have found promising results with fitting prosthetics and achieving steady gait in both elderly[12,13] and pediatric[14] patients with various indications for HD. This suggests that postoperative physical therapy is crucial for all patients undergoing HD regardless of age or comorbidity, as the possibility of regaining ambulation has considerable consequences for psychosocial wellbeing and quality of life. Optimization of nutrition is also imperative as nutritional status has implications for each aspect of the postoperative phase including wound healing, physical therapy, and ultimately survival.

Overall, HD should be reserved as a life-saving treatment for various indications including infections that fail other modalities, limb ischemia, trauma, and malignancy. Ideally, this procedure would be planned and performed on proper candidates; however, HD should still be a consideration in the emergent setting regardless of whether the patient is optimal due to its life-saving potential.

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