MAYO CLINIC

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INSIDE THIS ISSUE



# Prosthetic Rehabilitation After Hip Disarticulation and Hemipelvectomy

*Technology, Custom Fit, and Specialized Care Put Amputees Back In Action*

Hip disarticulation and hemipelvectomy amputation are relatively rare and invasive procedures. Transpelvic amputations are associated with extensive morbidity and mortality, both at the time of surgery and immediately thereafter. Beyond survival, success for these patients is measured in quality of life, including level of mobility, and functional independence. In collaboration with the amputee rehabilitation team, Mayo Clinic physiatrists and physical therapists help these patients regain a remarkably high rate of independence in self-care and mobility.

"With the latest prosthetic technology, people with a full-leg amputation can walk again," says Mayo Clinic physiatrist Karen L. Andrews, MD. "But many physicians are not yet aware that the technology exists."

In the past few years, Dr Andrews and her colleagues at Mayo have offered rehabilitation with the latest, custom-fitted prostheses that have state-of-the-art components, including hip and knee joints equipped with microprocessors. The computers located at the hinges tell each joint how much weight it needs to bear and where it is in space. "People used to have to think about each step when they were moving their prostheses," Dr Andrews explains. "Now the microprocessors in the joints do the thinking about each stride" (Figure).

Mayo Clinic treats between 10 and 20 patients a year who undergo hemipelvectomy because of tumors or traumatic injuries, and the computerized prostheses are options for many of them. For patients like Robert Anderson, an outdoorsy 40-year-old, this technology and the specialized physical therapy that Mayo

### Points to Remember

- Each year at Mayo Clinic between 10 and 20 patients undergo hemipelvectomy because of tumors or traumatic injuries.
- New custom-fitted prostheses that have state-of-the-art components, including hip and knee joints equipped with microprocessors, allow people with a full-leg amputation to walk again.

**Figure.** *Advances in prosthetic design, components, materials, and fabrication techniques allow patients who have the ability to walk on uneven surfaces and at variable cadences to function at a higher level than traditionally thought. Design changes have made the socket more comfortable and allow patients to wear their prostheses throughout the day. The prosthetic components (hip/knee) optimize gait stability and efficiency and reduce the risk of falling. These advances also help patients with hip disarticulation or hemipelvectomy-level amputation stabilize their prostheses and improve their initiation of gait and pelvic rotation. All these factors contribute to a more efficient, natural gait.*


*Karen L. Andrews, MD*

Clinic provides can dramatically improve quality of life after hemipelvectomy. When he learned the tumor in his leg would require a hip-level amputation, Mr Anderson's first reaction was that he'd rather die. Believing that walking would be impossible after the surgery, he was ready to forgo the treatment. After consulting with staff at Mayo Clinic, he received news that changed his mind, and he decided to undergo the hemipelvectomy. With physical therapy, Mr Anderson learned to walk over the course of several weeks using the new prosthesis. Today, he's not only walking, but has returned to the outdoor activities he loves.

"With these new computerized components, we're seeing people walking more smoothly than I ever would have hoped," Dr Andrews says. "It's important that doctors and patients know that for people requiring this level of amputation, there's technology available to provide a very active, very full life."

The prosthetic fitting process for patients undergoing hemipelvectomy and hip disarticulation requires considerable expertise as well as careful follow-up from both the patient and the rehabilitation team. After hemipelvectomy, patients frequently have more variability at the amputation site than patients undergoing other amputation procedures. The surgical technique used, as well as the amount of soft tissue involvement, varies among patients. The surgical team tries to shape bone surfaces to allow weight-bearing and provide as much soft tissue coverage as possible. Diligent postoperative wound care is also important.

Recognizing these challenges, Mayo Clinic physiatrists and orthopedic surgeons are currently working on 2 studies attempting to identify specific variables strongly associated with successful prosthetic fit and functional outcomes. Mayo researchers hope that their study results will help clinicians offer appropriate presurgical counseling and make well-informed choices about prosthetic fit.

## Spinal Cord Injury Rehabilitation

### *Coordinated Process and Multispecialty Collaboration Yield Strong Patient Outcomes*


*Mark W. Christopherson, MD*


*Lisa A. Beck, RN, CNS*

For more than 40 years, Mayo Clinic has served individuals with spinal cord disorders through its comprehensive Spinal Cord Injury (SCI) Program. About 140 to 150 persons with spinal cord dysfunction are treated in the acute rehabilitation unit yearly, with traumatic SCI accounting for 15% to 20% of those served.

Mayo Clinic physiatrists who provide care for patients with SCI have supportive, collegial, and cooperative relationships with surgeons, oncologists, neurologists, and multiple other medical specialists and subspecialists throughout Mayo Clinic. This collaboration, as well as Mayo Clinic's integrated medical record, enhances communication and supports timely, efficient patient care. Beyond creating a smooth-running system, this care model produces measurable patient outcomes. The need to prevent complications in patients with neurogenic bladder, for example, illustrates the benefits of this multispecialty collaboration. Only decades ago, neurogenic bladder problems were the No. 1 cause of mortality among SCI patients.

"Working with our colleagues in urology, we have found that implementing a system that uses more extensive monitoring, assessment, and feedback has helped us diagnose bladder problems earlier and prevent the onset of serious neurourologic complications," explains Mayo Clinic physiatrist Mark W. Christopherson, MD, medical director for the SCI program in Rochester, Minnesota. "We now have neurourologic rounds where we meet and discuss cases on a regular basis and provide close follow-up, all of which have greatly reduced the incidence of these problems."

**Points to Remember**

- A unique collaborative model of care and integrated medical record help Mayo Clinic rehabilitation staff work with other specialists to identify and prevent potentially serious problems.
- Mayo Clinic's acute rehabilitation unit serves one of the largest populations of nontraumatic spinal cord injury patients in the United States. Despite the extreme complexity and severity of spinal cord impairment and the large array of comorbid conditions present in these patients, more than 77% of patients discharged from Mayo Clinic's acute rehabilitation unit return to their homes.

Patients with traumatic SCI have access to a broad array of coordinated, specialized care designed to help each individual reach his or her optimal functional ability, level of wellness, quality of life, and reentry into the community. Mayo Clinic's spinal cord system of care often begins with a preoperative outpatient consultation and continues through the acute hospital and rehabilitation settings, a subsequent comprehensive interdisciplinary coordinated outpatient program, and lifelong follow-up.

The initial phase of treatment focuses on compensatory strategies and education to reestablish basic life skills of self-care activities; mobility, transfers, and gait; and learning to live a fulfilling life. In addition to the compensatory strategies, new restorative interventions are also used to achieve the highest possible functional outcome. These interventions may include functional electrical stimulation for upper and lower extremity function, biofeedback, and locomotor training, including robotic-assisted locomotor (Lokomat) training and over-ground ambulation with or without body weight support (Figure 1). More than 20 occupational and physical therapists skilled in SCI treatments and technology support these innovative services.

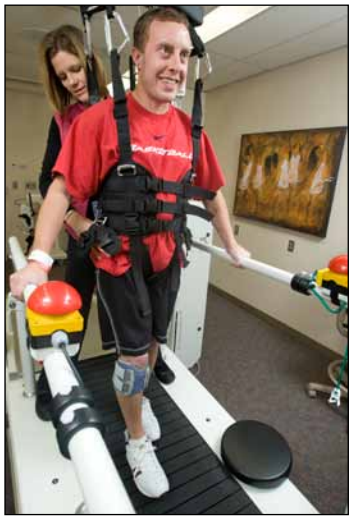


**Figure 1.** *Research has demonstrated the effectiveness of body-weight support treadmill training to improve quality and technique of walking.*

## Treatment of Patients With Nontraumatic Spinal Cord Dysfunctions

Each year, about 100 to 120 patients with a diagnostically diverse array of nontraumatic spinal cord dysfunctions (NTSCD), travel to Mayo Clinic from all over the world. This group of patients includes those diagnosed with unresectable vascular malformations, sarcomas, and other tumors that cause cervical, thoracic, lumbar, or sacral spinal cord dysfunction. Many of these patients have secondary complications similar to those associated with traumatic SCI, but they also tend to have additional comorbid conditions (Figure 2).

Patients with NTSCD are seen and treated in the acute hospital by the SCI team and also benefit from Mayo Clinic's unique model of care. "Our staff uses a well-defined process to identify patients early as candidates for comprehensive inpatient rehabilitation," explains Lisa A. Beck, RN, CNS, a clinical nurse specialist on Mayo Clinic's SCI team. "This allows our staff to decrease the time between symptom onset and rehabilitation admission."

According to Dr Christopherson, this coordinated process also helps yield excellent outcomes for patients with NTSCD served in the comprehensive acute rehabilitation program. "Once admitted, our patients have exhibited greater than average functional changes, on the basis of the Functional Independence Measure, and shorter than average lengths of stay. As a result, many of our patients have a greater level of independence on discharge."

Despite the extreme complexity and severity of the spinal cord impairment and large array of comorbid conditions present in these patients, more than 77% of the patients with NTSCD who are discharged from Mayo Clinic's acute rehabilitation unit return to their homes.

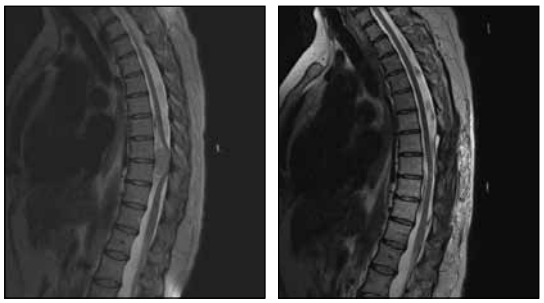
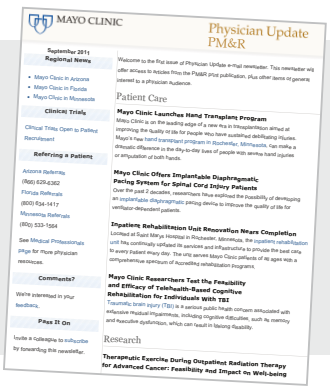


**Figure 2.** *MRIs showing meningeal tumor before and after surgical resection.*

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# Contact Us

Mayo Clinic welcomes inquiries and referrals, and a request to a specific physician is not required to refer a patient.

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# Resources

**mayoclinic.org/medicalprofs**

Clinical trials, CME, Grand Rounds, scientific videos, and online referrals

## Did You Know?

### Assisted Technology in Mayo Clinic's Inpatient Rehabilitation Program

Patients admitted to Mayo Clinic's inpatient rehabilitation unit have access to specialized computers that are mobile, adjustable, and equipped with several accessibility options available to accommodate a variety of impairments:

- Dragon Naturally Speaking speech recognition software that allows full voice command to compensate for impaired upper extremity function. If the user's voice is impaired, the user navigates the computer using a head mouse and switches for mouse clicks.
- Software that provides configurable word prediction, a screen reader, single-switch scanning, text-to-speech, screen magnification, an on-screen keyboard, and more.
- Skype, an Internet and video calling service that allows patients to communicate via video call with friends or family.
- Wireless Internet connection so patients can manage finances, check e-mail, etc.

Patients receive assistance with optimal access methods and support as they learn and information about where to purchase or lease equipment they may need after dismissal from the hospital.

## Education Opportunities

### American Board of Physical Medicine and Rehabilitation Board Certification, Part II Examination, May 19-20, 2012, Rochester, Minnesota

Part II (oral) examination of the American Board of Physical Medicine and Rehabilitation certification will take place in Rochester, Minnesota. Mayo Clinic's Department of Physical Medicine and Rehabilitation extends a warm welcome to all candidates participating this year.

### Diagnostic and Interventional Musculoskeletal Ultrasound, July 19-21, 2012, Rochester, Minnesota

This 3-day course is a collaboration of Mayo Clinic and the American Institute for Ultrasound in Medicine (AIUM). The teaching format accommodates learners at beginner and intermediate/advanced levels and consists of lectures, live demonstrations, and extensive hands-on experiences on live models and unembalmed cadavers. This course is appropriate for physiatrists, sports medicine physicians, radiologists, orthopedic surgeons, anesthesiologists, rheumatologists, sonographers, and other clinicians who evaluate and treat patients with musculoskeletal and neurologic diseases. Registration will be available online at www.aium.org. For information, please visit the AIUM Web site, contact Danielle Delanko at ddelanko@aium.org, or call 800-638-5352 or 301-498-4100.

### Neurorehabilitation Summit, October 25-26, 2012, Rochester, Minnesota

Neurology, neurosurgery, and physical medicine and rehabilitation professionals need an opportunity to gather and learn about the latest developments, share ideas and concepts, and create sustainable collaborations. To meet this need, the Neurorehabilitation Summit covers a wide range of topics related to common diagnoses: brain disorders, spinal cord injury/disorders, and neurodegenerative diseases. The summit addresses research initiatives, advances in medicine, innovative technology, and clinical applications to strengthen the continuum of care for these patients. For more information about this course, call 800-323-2688 or e-mail cme@mayo.edu.

### 22nd Annual Mayo Clinic Symposium on Sports Medicine, November 9-10, 2012, Rochester, Minnesota

This case-oriented program provides an integrated approach to the injured athlete. Case presentations, lectures, and video demonstrations make this course interesting to all sports medicine practitioners. The program has been developed for health care professionals with an interest in sports medicine and will also be of interest to athletic trainers. For more information about this course, call 800-323-2688 or e-mail cme@mayo.edu.

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