CASE RECORDS of the MASSACHUSETTS GENERAL HOSPITAL

Case 36-2012: Recovery of a 16-Year-Old Girl from Trauma and Burns after a Car Accident

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PRESENTATION OF CASE

A 16-year-old girl was admitted to this hospital because of trauma and extensive burns sustained in a motor-vehicle accident.

The patient had been well until the day of admission when, while driving alone and restrained with a seat belt, her vehicle collided at high speed with a tree and burst into flames. She reportedly had blunt head trauma and was trapped in the burning vehicle with windows closed for approximately 10 minutes, until extricated by passersby who shattered a window. She reportedly was initially awake and in severe pain. Emergency medical service responders sedated and intubated her at the scene because of extensive burns to the face and concern for airway patency. She was immobilized with a cervical collar and a backboard and was transported by medical helicopter to this hospital.

The patient had a history of hypothyroidism, for which she took levothyroxine daily. She had no known allergies. She was a high-school student, lived with her parents and a sibling, and was a highly competitive athlete.

On examination in the emergency department, the patient was unconscious, sedated, and paralyzed, and the trachea was intubated. The temperature was 35.6°C, the blood pressure 156/101 mm Hg, the pulse 108 beats per minute, and the oxygen saturation 100% while high-flow oxygen was being delivered. The pupils were 2 mm in diameter and minimally reactive bilaterally. There were intermittent, slight spontaneous movements of both arms and the left leg. There were burns on the face, vibrissae, eyebrows, eyelashes, hair, and scalp. Full-thickness burns involved approximately 70% of the skin surface, including most of the torso and distal limbs, which were tense on examination. The legs had sustained distal soft-tissue avulsion with extensive soft-tissue loss. Spared areas included the left upper chest and the posterior-medial portion of the left leg and thigh. There were large, stellate lacerations on the anterior right knee. Breath sounds were normal, and the chest was stable. The abdomen was soft and not distended. The pelvis was stable. There were palpable pulses in the left wrist and leg. No pulses were identified in the right wrist, right leg, or feet by palpation or by noninvasive Doppler studies. A subclavian venous catheter, nasogastric tube, and bladder catheter were placed; the latter drained bright-red urine.

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The hematocrit was normal, and a screening test for troponin I was negative; blood levels of magnesium, total protein, albumin, amylase, lipase, and creatine kinase isoenzymes were normal, as were renal- and liver-function tests and tests of coagulation. Other test results are shown in Table 1. The stool was positive for occult blood. An electrocardiogram showed nonspecific ST-segment and T-wave abnormalities. Fentanyl, midazolam, and vecuronium were administered for sedation, analgesia, and neuromuscular blockade, followed by continuous intravenous infusions of fentanyl, midazolam, and warmed crystalloid solution.

Radiographs of the chest, abdomen, and pelvis showed no fractures or other acute processes. Computed tomography (CT) of the head, performed without the administration of contrast material, revealed multiple small, hyperintense foci that were consistent with contusions and intraparenchymal hemorrhage, two small areas of subarachnoid hemorrhage, and mild subcutaneous edema in the left malar region, without fractures or midline shift. CT of the cervical spine, thorax, abdomen, and pelvis, performed after the administration of intravenous contrast material, showed no evidence of aortic dissection, fracture, intraabdominal trauma, or free air or fluid. A tetanus–diphtheria vaccine booster was administered.

Management decisions were made.

DISCUSSION OF MANAGEMENT

Dr. Robert L. Sheridan: The focus of this conference is on long-term recovery from severe trauma, so the discussion of the initial management of this patient's condition will be brief.

INITIAL MANAGEMENT OF SEVERE TRAUMA

Coincident with ventilation and fluid resuscitation in this patient with burns and blunt trauma, initial care requires clear identification and prioritization of injuries. This is often difficult, since management priorities for the different injuries can conflict with one another (Table 2).[1] The diagnosis of injuries is also difficult in a patient such as this one, since the presence of a large burn can obscure deeper injuries and impair the accuracy of serial physical examinations. Management principles include serial examinations, liberal use of imaging, and a high index of suspicion based on the mechanism of injury. In this teenager who had a large, deep burn and had had a high-energy blunt impact, all three principles were used.

May we review the imaging studies?

Dr. Pamela W. Schaefer: CT of the head was performed without the administration of contrast material 49 minutes after the patient's arrival in the emergency department (Fig. 1). CT images show multiple punctate hyperdense foci in the left frontal and temporal lobes, findings consistent with hemorrhagic shear injuries. There are small foci of subarachnoid hemorrhage in the right frontal and left parietal lobes and a small amount of hemorrhage in the septum pellucidum and the posterior horn of the left lateral ventricle. There is diffuse cerebral edema with partial effacement of the basilar cisterns and mild left uncal herniation. Images from CT of the head performed the next day show progressive edema but no new intracranial hemorrhage.

Dr. Sheridan: Examinations and imaging revealed that the patient's primary issues were blunt brain trauma, soft-tissue lacerations, inhalation injury, and extensive burns. As is true for all patients with multisystem trauma, coordination and communication between services is essential; a highly organized, systematic approach will enhance outcomes.[2]

In many patients with deep burns, life-threatening and limb-threatening compartment syndromes develop as a result of edema beneath inelastic eschar, in fascial compartments, or both. Early decompression improves rates of limb salvage. This patient was taken to the operating room shortly after arrival for escharotomies and fasciotomies of all four extremities and the torso, which resulted in immediately enhanced distal blood flow and improved ventilation (Fig. 2A through 2D). During this procedure, inhalation injury was confirmed by bronchoscopy.

After initial resuscitation and decompression, we had to balance the need for fluid resuscitation with the presence of a brain injury and its associated risk of worsening cerebral edema, as well as inhalation injury. A ventriculostomy helped to manage cerebral perfusion pressure during resuscitation. Necrotic burned skin, fat, and muscle were excised during the first few days, and the resulting wounds were closed with autograft

Table 1. Laboratory Data.*

Variable	Reference Range, Age-Adjusted†	On Arrival
Blood		
White-cell count (per mm^3)	4500–11,000	35,500
Differential count (%)		
Neutrophils	40–70	82
Band forms	0–10	7
Lymphocytes	22–44	9
Atypical lymphocytes	0	1
Monocytes	4–11	1
Platelet count (per mm^3)	150,000–350,000	565,000
Sodium (mmol/liter)	135–145	139
Potassium (mmol/liter)	3.4–4.8	3.5
Chloride (mmol/liter)	100–108	112
Carbon dioxide (mmol/liter)	23.0–31.9	21.0
Glucose (mg/dl)	70–110	176
Phosphorus (mg/dl)	3.0–4.5	2.6
Calcium (mg/dl)	8.5–10.5	7.7
Creatine kinase (U/liter)	40–150	730
Aspartate aminotransferase (U/liter)	9–32	64
Toxicologic screening	Negative	Negative
Urine		
pH	5.0–9.0	7.0
Specific gravity	1.001–1.035	1.020
Screening dipstick		
White cells	Negative	3+
Nitrites	Negative	Positive
Albumin	Negative	3+
Glucose	Negative	Trace
Ketones	Negative	1+
Blood	Negative	3+
Sediment		
Hyaline casts (per low-power field)	0–5	3–5
Granular casts (per low-power field)	Negative	3–5
Red cells (per high-power field)	0–2	3–5
White cells (per high-power field)	0–2	3–5
Squamous epithelial cells (per high-power field)	Negative	Many
Bacteria (per high-power field)	Negative	Moderate
Amorphous crystals (per high-power field)	Negative	Moderate
Human chorionic gonadotropin	Negative	Negative
Toxicologic screening	Negative	Positive for benzodiazepines

* To convert the values for glucose to millimoles per liter, multiply by 0.05551. To convert the values for phosphorus to millimoles per liter, multiply by 0.3229. To convert the values for calcium to millimoles per liter, multiply by 0.250.
† Reference values are affected by many variables, including the patient population and the laboratory methods used. The ranges used at Massachusetts General Hospital are age-adjusted for patients who are not pregnant and do not have medical conditions that could affect the results. They may therefore not be appropriate for all patients.

Table 2. Management Conflicts and Compromises Associated with the Care of Patients with Burns and Coincident Trauma.

Variable	Management Conflicts	Common Compromises
Coincident neurotrauma	Detection of progressive head injury may be difficult when patients with burns need sedation and analgesia for their wounds.	Liberal use of serial neurologic examination and serial CT scanning is important if the mechanism of injury is consistent with possible head trauma.
	Cerebral edema due to head trauma must be controlled coincident with the administration of massive volumes of fluid that are commonly required for the resuscitation of patients with burns.	A resuscitation that includes early use of colloid minimizes the fluid-resuscitation volume.
	Intracranial-pressure monitors provide data but can become infected and cause meningitis if they pass through or close to burn wounds.	The use of neurologic examination and repeated CT scans is preferred over the use of pressure monitors.
Coincident chest trauma	Patients with blunt chest injuries and overlying burns may require chest tubes to be placed through burned areas, which would confer a risk of empyema.	In some cases, chest tubes can be placed in nonstandard locations to avoid passage through injured skin. Small tubes are used for pneumothorax. Tubes should be removed as early as possible.
	Chest-tube removal can be complicated if a deficiency of overlying soft tissue precludes closing the tract.	A long, subcutaneous tunnel can be fashioned during placement of the chest tube to improve the ability to close the tract.
Coincident abdominal trauma	Blunt abdominal injuries may be difficult to detect if there is an overlying burn that complicates physical examination.	Liberal use of imaging can reveal occult injuries.
	The incidence of wound dehiscence and infection seems to be higher when laparotomies are performed through a burned abdominal wall than through a nonburned wall.	Retention sutures can be used to reinforce closure of abdominal wounds in patients with abdominal-wall burns.
Coincident orthopedic trauma	Operative management of a fracture may be associated with infection and exposed hardware if incisions must be placed through burned skin.	Initial external fixation and immediate burn excision and grafting, with delayed internal fixation, should be considered, along with the nailing of long bones through distant incisions when possible.

and allograft; allografted wounds were later closed with autograft as donor sites reepithelialized (Fig. 3A). Unfortunately, fourth-degree burns of three extremities precluded limb salvage, despite early decompression. The patient required bilateral below-knee amputations and amputation of most of her right (dominant) hand.

SETTING EXPECTATIONS FOR RECOVERY

A critical variable in the recovery process is the family. This patient was fortunate to have a highly organized and expressive family, characteristics that are associated with improved outcomes.[3] An important part of the initial caregiver's job, when managing massive trauma, is to develop and clearly articulate an overall plan of care that includes optimistically realistic expectations for recovery. This can be surprisingly difficult, but it helps patients and their families understand and participate in the process of care and helps medical staff to focus their efforts in a coordinated way. The process and the expectations should be shared with the multidisciplinary care team so that they can be constantly and consistently reinforced. Framing and communicating realistic but positive prospects in a deliberate way help to fuel an underlying expectation that meaningful recovery and genuine happiness are possible, despite what may seem to be an overwhelmingly adverse event. Understanding the complex process of care and its duration and accepting optimistic but realistic expectations for recovery seem to improve the ability of patients and their families to achieve good outcomes. High goals for rehabilitation were set early and shared with this patient and her family.[4]

Other members of the care team will discuss the short-term and long-term effects of inhalation injury and traumatic brain injury on recovery from massive trauma. They will also discuss management of the patient's psychiatric well-being and the management of her prosthetics and rehabilitation.

TRAUMATIC BRAIN INJURY

Dr. Michael Whalen: Trauma is the leading cause of death in children and adolescents, and most trauma-related deaths are due to traumatic brain

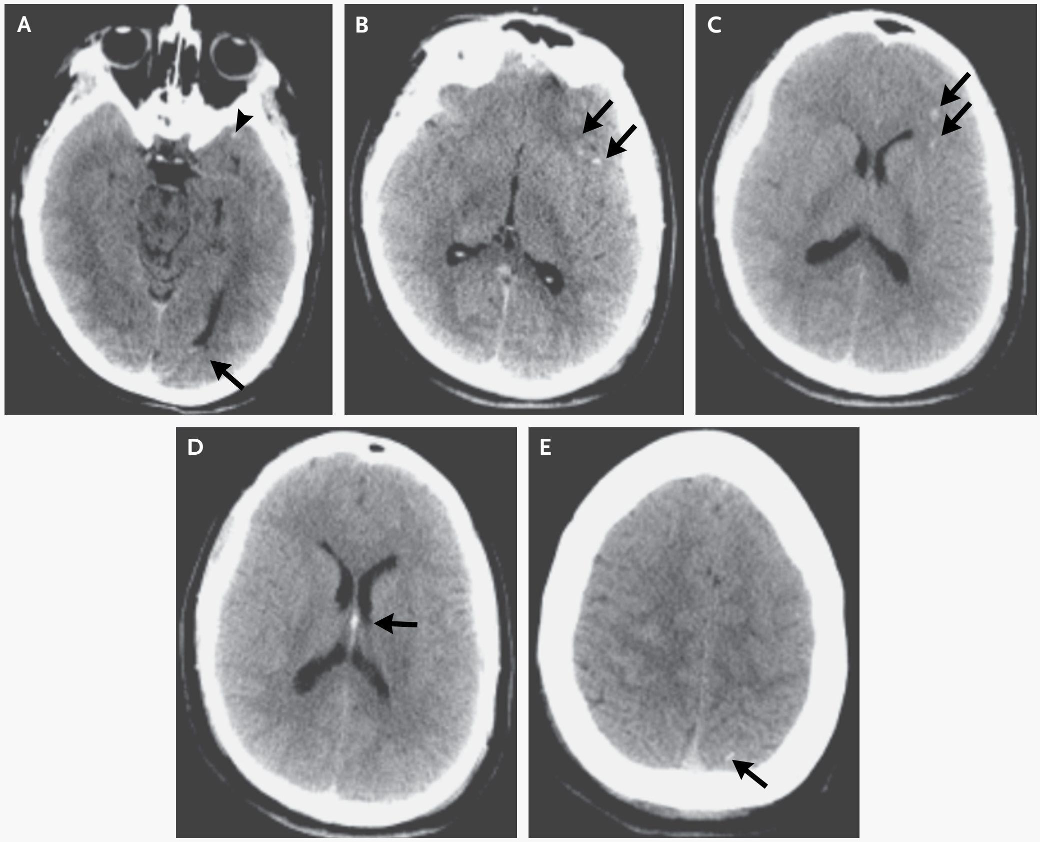

Figure 1. Images from CT of the Head Performed without the Administration of Contrast Material.

Multiple punctate hyperdense foci, findings consistent with hemorrhagic shear injuries, are shown in the left temporal lobe (Panel A, arrowhead) and the left frontal lobe (Panels B and C, arrows). A small amount of hemorrhage is seen in the septum pellucidum (Panel D, arrow) and in the posterior horn of the left lateral ventricle (Panel A, arrow). There is a small focus of subarachnoid hemorrhage in the left parietal lobe (Panel E, arrow) and diffuse, mild cerebral edema with mild left uncal herniation.

injury (TBI) and intracranial hypertension. Severe TBI (score on the Glasgow Coma Scale [GCS], <8; GCS scores range from 3 to 15, with lower scores indicating reduced levels of consciousness) contributes to worse outcome in patients with trauma.[5] This patient was reported to have been alert after the accident, but the GCS score was not recorded and could not be assessed on arrival to this hospital because of the patient's sedation. CT at admission confirmed the presence of diffuse blunt brain trauma with brain edema and uncal herniation. Pharmacologic paralysis was required for the facilitation of mechanical ventilation, preventing adequate neurologic examination to assess possibly worsening neurologic status.

Risk factors for cerebral edema in this patient include the mechanism of injury (high-speed motor-vehicle accident, producing subarachnoid and intraparenchymal hemorrhage), young age,[6] fluid resuscitation required for the massive burns (4.2 ml per kilogram of body weight per percent burn area in the first 24 hours), and hypercarbia (partial pressure of arterial carbon dioxide, 58 to 72 mm Hg). Therapy for TBI is directed toward controlling intracranial pressure and preventing the secondary insults known to worsen outcome.[7] Surgical management includes evacuation of mass lesions (hematomas and contusions), drainage of cerebrospinal fluid, and monitoring of intracranial pressure. The placement of intracerebral monitoring devices may be delayed and increases the risk of infectious complications in patients, such as this one, with facial and scalp burns.[1] In this case, neurosurgical consultation was obtained

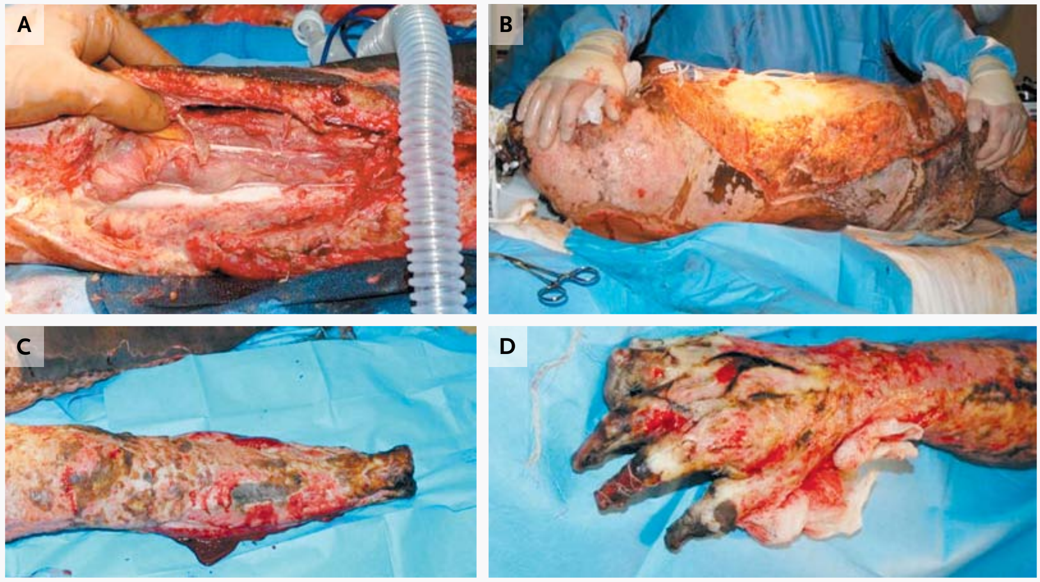

Figure 2. Photographs of the Patient's Injuries.
The muscle of the right leg shows thermal injury on initial decompression (Panel A). The skin of the back was extensively burned. Panel B shows the back after initial excision, and Panel C shows the right leg after initial excision. The right hand was severely burned and could not be salvaged (Panel D).

on the second hospital day and an intracranial-pressure monitor was placed, which showed an elevated intracranial pressure of 40 mm Hg.

Medical and surgical management of TBI in this patient followed recently published consensus guidelines for the management of severe TBI in adolescents and adults[8] and included intravenous sedation, administration of isotonic fluids, prevention of hyponatremia, elevation of the head of the bed to 30 degrees to promote jugular venous drainage, mechanical ventilation to ensure normocapnia and normoxemia, and osmotherapy with mannitol to treat sustained increases in intracranial pressure of more than 25 mm Hg. Osmotherapy with hypertonic saline is also commonly used. After this patient had a minimal response to mannitol, the cerebrospinal fluid was drained with a ventriculostomy catheter to reduce the intracranial pressure. Intracranial hypertension improved and remained controlled with continued drainage and medical therapy. Additional therapies for refractory intracranial hypertension include barbiturate coma, induced hypothermia, and decompressive craniectomy, none of which were required in this case. Therapeutic hypothermia and decompressive craniectomy reduce intracranial hypertension but have not been shown to improve outcome after TBI in randomized, controlled studies.[9,10]

The ventriculostomy drain was discontinued on hospital day 6. Magnetic resonance imaging performed on day 14 revealed evidence of traumatic axonal injury in the regions of hemorrhage noted on the CT scans, left cerebellar tonsillar ectopia, and resolved brain edema. On transfer to the Boston Shriners Hospitals for Children burn unit, the patient was awake and could follow commands. It is likely that the excellent outcome in this case resulted from the relatively moderate degree of structural brain injury and the coordinated execution of care by the burn and trauma surgery and neurosurgery teams.

INHALATION INJURY

Dr. Shawn Fagan: This patient was exposed to burning gasoline in a closed space. The diagnosis of inhalation injury was confirmed on the first hospital day by bronchoscopy, with findings of carbonaceous debris and edema in the major airways. An inhalation injury is a clinical syndrome that usually includes some degree of early airway obstruction and late failure of gas exchange; in-

Figure 3. Rehabilitation and Prostheses.

After bilateral below-the-knee amputations, the residual legs were covered with skin grafts (Panel A). The patient lost most of her right hand and both lower legs and feet (Panel B) and was evaluated for prostheses. A pair of prosthetic feet was crafted to address her wish to be active in athletics (Panel C). With practice and the use of a pin-and-ratchet device, the patient was eventually able to don and doff her prosthetics despite the loss of her right hand (Panel D).

halation injuries are also associated with increases in mortality of up to 30% among patients with burns.[11] This patient was intubated, which prevented edema-related upper-airway obstruction and its consequences. As is typical, gas exchange was initially normal but deteriorated during the next few days as endobronchial debris accumulated and alveolar edema worsened.[12] The ratio of the partial pressure of arterial oxygen to the fraction of inspired oxygen (Pa_{O_2}:Fi_{O_2}) is commonly used to define gas exchange in cases of respiratory failure; a normal Pa_{O_2}:Fi_{O_2} ratio is over 300. The patient's initial recorded Pa_{O_2}:Fi_{O_2} ratio was 293 but deteriorated over a period of days to 214, which is approaching a level that is consistent with a diagnosis of the acute respiratory distress syndrome.[13] The case underscores the delicate balance that needs to be achieved when resuscitating a patient with a large thermal injury and concomitant head and inhalation injuries. During resuscitation of this patient, fluids were carefully adjusted to minimize cerebral and pulmonary edema and simultaneously provide adequate hemodynamic stability. She required a tracheostomy to help manage the ventilator dependence, multiple operations, and facial burns. Respiratory function gradually returned to normal, and the trachea was extubated on the 66th hospital day.

In survivors of inhalation injuries, long-term morbidity varies but is often low. This has been demonstrated by this patient, who now exercises up to 3 hours per day.

PSYCHIATRIC ISSUES IN RECOVERY

Dr. Frederick J. Stoddard, Jr.: Initial psychiatric goals in this case were to control pain[14] and to mitigate the patient's acute stress disorder and the effect of gradually dawning traumatic memories when her sedation was being tapered.[15,16] Subsequent goals, during the intermediate postinjury period, were to help her and her family cope mentally and emotionally with sadness and the symptoms of post-traumatic stress disorder (PTSD), which included nighttime agitation and sleep disturbance.[17] Long-term goals were to help her return physically, mentally, and psychosocially to a level of independent function.

Management of PTSD during the intermediate period is essential to early restoration of function. Management involves clear explanations of what has transpired, control of pain, and treatment of sleep disturbance, anxious despair, and panic with anxiolytic and antipsychotic agents. In this patient, treatment included carefully adjusted doses of morphine, midazolam, lorazepam, and sertraline.[18-20] Risperidone was prescribed for her most intense anxiety, which occurred during early rehabilitation. Uncontrolled anxiety substantially impairs participation in critical aspects of rehabilitation, especially physical therapy.

Adaptation to disfigurement and functional loss in an adolescent is a first step toward recovery. We helped this patient develop the ability to make sense of and give meaning to her experience and to grieve her losses.[21] As she achieved a solid recovery, we were able to taper and finally discontinue all medications except the antidepressants. Working through grief about her injuries, receiving hopeful and positive psychotherapeutic support, preparing carefully for procedures, being selective about the use of psychopharmacologic agents, and mastering cognitive skills are all critical in helping a patient who has been so massively traumatized to overcome the many obstacles to recovery.[22,23]

REHABILITATION AFTER MASSIVE TRAUMA

Dr. Jeffrey C. Schneider: This patient had the typical complex rehabilitative needs of patients who survive massive multisystem injuries.[4] After a 7-month hospital stay, the patient was discharged home; she was independent with transfers and with wheelchair mobility, and she was able to perform her own activities of daily living. At Shriners Hospitals for Children in Springfield, Massachusetts, she was fitted for bilateral below-knee prostheses and began outpatient rehabilitation therapy, including gait training.

Rehabilitation after an amputation is a multistage process. Before this patient was fitted for prosthetics, the skin grafts on her residual legs needed to heal. Incipient flexion contractures of the hips and knees had to be addressed with range-of-motion exercises. Muscle weakness had to be addressed with exercise, which was painful. Ambulation with bilateral below-knee prostheses requires approximately 40% more energy expenditure than able-bodied ambulation[24] and requires substantial balance and cardiovascular reserve. Maturation of a residual limb is required before the fitting of a definitive prosthesis. Maturation has occurred when postoperative edema has resolved, the volume of the limb has stabilized, and the limb has molded into a cylindrical shape that optimizes prosthetic fitting.

For this patient, the task of learning to walk with prosthetic legs was confounded by the altered symmetry of the body (due to multiple amputations) and impaired proprioception (due to the loss of both feet).[25] Gait training began with weight shifting and balance activities and progressed to ambulation, initially with the support of parallel bars. Physical therapists trained the patient in transfer skills, knee stability, equal step lengths, and avoidance of lateral trunk bending. Training progressed from level-surface ambulation to stairs, uneven terrain, and ramps. Ultimately, she learned to drive and to master recreational and vocational tasks.

After a month of intensive therapy, the patient progressed to ambulating with a single crutch. After 3 months of therapy, she was able to walk independently without an assistive device. Now, approximately 5 years after her accident, she exercises daily; the exercising includes lifting weights and using an elliptical trainer and a treadmill. Her residual legs were covered by skin grafts that are particularly susceptible to the pressure and shearing forces of the prostheses and require vigilant monitoring; multiple open wounds and skin infections developed in the first few months of prosthetic use. Loss of volume of residual limbs continues up to 18 months after amputation and necessitates regular outpatient monitoring for skin breakdown.[26] With each occurrence of skin breakdown in this patient, a rest from prosthetic use was required to allow appropriate healing.

Community reintegration is the ultimate goal after massive trauma. Nine months after her injury, the patient returned to high school; she graduated with her class later that year, and she is currently enrolled in college. Cognitive and psychological issues related to the TBI compounded her physical impairments and were obstacles in her progress toward successful community reentry.[27,28] She had many of the common cognitive problems associated with TBI, including headache, decreased memory, slow mental-processing speed, poor attention, sleep disturbance, and irritability, all of which affected her quality of life and her performance at school and at work. With time, these issues resolved, but they can become chronic problems, especially if inadequately addressed.[29] In the future, patients such as this one may benefit from targeted muscle reinnervation, myoelectric prosthetic control, and complex allografts,[30,31] but with hard work and realistic expectations, even patients as seriously injured as this one can reintegrate very well.

PROSTHETIC DESIGN, FITTING, AND USE

Mr. Brock McConkey: There were many factors to consider in planning the prosthetics for this patient. Current technology in the field of prosthetics requires individualized clinical assessments of the patient by the prosthetist for proper configuration of the devices.[32] In this patient, we assessed skin condition, level of amputation, extremities involved, weight, activity level, ability to don and doff, and the patient's own unique desires (Fig. 3B).

In this patient, silicone-free, thermoplastic elastomer gel liners covered in a slick, spandex-like material infused with skin-conditioning mineral oil were the best choice to protect the fragile skin grafts on the residual legs. The patient had been a star soccer player before her injury and had high hopes of returning to the same level. A variety of prosthetics were crafted over time to address her increasing capabilities. Cosmetics were not a big issue for this patient, so the metal pylons that connect the feet and the socket were left exposed (Fig. 3C). The loss of her right (dominant) hand interfered with her ability to don and doff her legs. We crafted a system with a pin and a ratchet lock that, with practice, allowed her to don and doff the prostheses herself (Fig. 3D).

A year later, the patient wanted to be able to wear shoes with varying heel heights, so she was outfitted with adjustable feet that, with the push of a button, would allow her to change her shoes from flats all the way to two-inch heels. During the next 2 years, she became more active and lost weight, and up to three times a year new sockets were made. She also wanted the prostheses to feel more a part of her. The tighter the socket was around her residual leg, the lighter the prosthesis could be, and the more it could feel as if it were part of her. She has recently been fitted with a system that creates a cup vacuum to help regulate volume changes in the residual leg for a stronger and more consistent fit (see video, available with the full text of this article at NEJM.org).

A video showing the patient running is available at NEJM.org

THE MILITARY'S PERSPECTIVE OF MASSIVE TRAUMA

Dr. Leopoldo C. Cancio: This patient has achieved a good functional and emotional outcome after a mutilating multisystem injury. This has been our objective when we care for combat casualties from the conflicts in Iraq and Afghanistan. The most common and damaging agent in these conflicts has been the improvised explosive device, which may cause a combination of amputations, TBI, and burns. Such multisystem trauma is difficult to manage, both in the short term and in the long term. The organized system of short-term care now being used has increased the survival rate associated with these injuries[33] but has also generated new requirements for complex rehabilitation.[34] The focus on holistic recovery in this case is consistent with how the military programs have evolved. As described in this case, an emphasis on very early rehabilitation and the setting of high expectations for recovery are extremely useful in the treatment of combat casualties. Most of these young people were young, fit, athletic, and determined before they were injured. We try to reinforce these qualities as we work toward optimizing their recoveries.[35]

Dr. Nancy Lee Harris (Pathology): The patient and her parents are with us today.

The Patient: For a while, the main issue for me was the question, "Why me?" As time went on and I saw myself becoming more independent, that issue faded away. I was lucky to have incredible support from family and friends. Of course, I had moments when I lay in bed crying and hating my "new body." I was a teenage girl with a bright soccer future, and then everything changed in the blink of an eye. But I snapped out of it somehow and realized that I still have my entire life ahead of me, and I can still do great things.

When I first started going out in public, I hated the stares I got, so I would cover my arm, hand, and legs. But I gradually realized that they are stares of curiosity. It's not every day that you see a person walking around with prosthetic legs and scars. I never hide my legs or my arm anymore, because it's who I am. My scars and prosthetic legs are a part of me, and they tell my life story, so I can't be ashamed of them. I'm a stronger person because of my injuries. And I no longer take anything for granted.

Dr. Harris: Are there any questions or comments?

Dr. Sheridan: I would like to recognize the important contributions to this patient's care that were made by Drs. Peter Masiakos and David Lawlor and by the surgical intensive care unit and operating room teams. Also, I believe that the more that we acute care surgeons stay involved with the aftercare part of the system, the better our patients will do and the more we can learn about how to optimize their outcomes.

ANATOMICAL DIAGNOSIS

Multiple trauma, extensive burns, traumatic brain injury, and inhalation injury.

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

This case was discussed at Surgery Grand Rounds.

Dr. Stoddard reports serving as an expert witness in a case of burn injury. Dr. Schneider reports receiving consulting fees from Best Doctors. Dr. Cancio reports receiving income to his institution resulting from his coinvention of Burn Resuscitation Decision Support; the rights have been reassigned to the U.S. Army, which has licensed the product to Arcos for development. No other potential conflict of interest relevant to this article was reported.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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