

LESSONS LEARNED AT THE INTERFACE OF MEDICINE AND PSYCHIATRY

The Psychiatric Consultation Service at Massachusetts General Hospital (MGH) sees medical and surgical inpatients with comorbid psychiatric symptoms and conditions. Such consultations require the integration of medical and psychiatric knowledge. During their twice-weekly rounds, Dr. Stern and other members of the Consultation Service discuss the diagnosis and management of conditions confronted. These discussions have given rise to rounds reports that will prove useful for clinicians practicing at the interface of medicine and psychiatry.

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Reactions to Amputation: Recognition and Treatment

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Have you ever wondered how your patients will react to the news that an amputation is required or cope with the functional disability that may result? Have you wondered whether psychiatric problems (such as depression and posttraumatic stress disorder [PTSD]) are predictable following amputation? Have you thought about how patients adapt to physical rehabilitation as they regain function?

If you have, then the following case vignette and discussion should serve as a stimulus for the management of the psychiatric aspects of amputation and its aftermath.

CASE VIGNETTE

Ms. A, a 51-year-old woman with diabetes mellitus (DM) type II and peripheral vascular disease (PVD), presented with several purulent, nonhealing ulcers of the right medial malleolus, sepsis, and wet gangrene of the right leg. Blind, as a complication of her DM, she had been poorly compliant with her care; she arrived at the hospital because she could no longer walk. Laboratory workup revealed an elevated erythrocyte sedimentation rate and magnetic resonance imaging (MRI) evidence of advanced osteomyelitis. A surgical consultant recommended a right-sided below-the-knee amputation.

How Common Is Amputation Among Primary Care Patients?

Amputation is not an infrequent event for primary care patients. Moreover, it is often preceded by poor compliance with medical care and by complications. Most amputations in the United States are a consequence of chronic vascular disease: 82% of amputations done in this country each year are a result of DM or PVD.¹ Approximately 50,000 lower-limb amputations are done annually; roughly 300,000 persons living in the United States are survivors of 1 or more limb amputations. Unfortunately, there is only a 2- to 5-year life expectancy following amputation for chronic vascular disease for 60% of patients because of the risk of death from cardiovascular disease.² Among primary care patients with DM, lower-limb amputations are required in approximately 1% to 7%,³ and 20% to 50% risk losing the contralateral leg to vascular disease over the subsequent 4 years.⁴ Patients with end-stage renal disease (ESRD) have a 10-fold greater risk of amputation than those with DM without ESRD.⁵ Among patients who present to general hospitals with limb ischemia from severe, chronic PVD, up to one third undergo amputation and require subsequent primary care follow-up.⁶ Men sustain amputations more often than do women, and most such surgeries are done in those over the age of 60 years. Women who undergo amputation are usually more severely ill and have a poorer prognosis than men.⁷⁻⁹

Up to 30% of patients with soft tissue infections (such as necrotizing fasciitis) undergo partial or complete limb amputations,¹⁰ while extensive limb resections in cancer (i.e., among those with musculoskeletal tumors) have become increasingly uncommon. Burn victims with deep tissue burns and ongoing renal failure may require partial amputation; 8% to 10% of trauma patients who present with arterial injuries require amputation after failed attempts at revascularization.¹¹ Among military personnel, who are at grave risk for landmine and shrapnel injuries, amputation (occurring in 10%–16% of wounded soldiers) often results from contaminated wounds and soft tissue destruction in the field.¹² Roughly 3500 traumatic amputations are performed each year on soldiers, despite multiple preventive programs instituted by the military and other agencies.¹² In Operation Iraqi Freedom alone, 50% to 70% of all battlefield injuries have involved vascular injuries of the extremities.¹²

What Conditions Lead to Amputation?

Amputation results from medical, surgical, or psychiatric causes. Each can be devastating and difficult to manage. Psychiatric conditions (involving substance abuse, character disorders, or disorders of thought or mood that predispose to suicide attempts with limb injuries) leading to amputation may be particularly challenging in primary care.¹³

Medical causes of amputation include DM, osteomyelitis, peripheral embolization (from septic, fat, amniotic, or paradoxical emboli), PVD, thromboses (from disseminated intravascular coagulation), thrombocytosis (in hematologic malignancy), necrotizing soft tissue infections (such as necrotizing fasciitis and clostridial “gas gangrene”), and iatrogenic events (as from heparin-induced thrombocytopenia with thromboses). Malignancies, such as malignant sarcomas, may also require amputation.¹³

Surgical causes can be divided into accidental trauma and intentional or combat-related amputations. Accidental trauma is associated with subway and train accidents, work-related construction and factory mishaps, falls, high-voltage electrical burns, and motor vehicle collisions. Combat-related trauma often involves the explosion of landmines and other sources of shrapnel. Traumatic amputations are often linked with intense fear, horror, images of others being injured, and startling sounds that resurface during rehabilitation (even in the absence of full criteria for PTSD).¹³

How Do Patients Typically React to News That Amputation Is Required?

Immediate reactions to the prospect of amputation vary; they depend on whether the amputation was planned, occurred within the context of a chronic medical illness, or was necessitated by the sudden onset of infec-

tion or trauma. The context for amputation affects the psychological sequelae during the rehabilitation phase as well. When there is time to think about impending loss, classic stages of grief may be experienced.¹⁴ Among these stages are denial (often manifest as a refusal to engage in discussion or to ask basic questions about the planned procedure), anger (which may be directed toward the medical team, with expressions of being “cheated” or “tricked” into agreeing to an amputation), bargaining (by attempting to forestall the surgery or to delay it indefinitely for a myriad of reasons such as “I’m too tired, I don’t want to go through with any major surgery”), depression (taking the form of “learned helplessness,” feelings of passivity, and being overwhelmed), and acceptance (which may not be reached until the patient is well into the rehabilitation process).¹⁵

After learning that amputation may be required, anxiety often alternates with depression. This anxiety may be generalized (e.g., manifest by jitteriness, a decreased ability to sleep, silent rumination, and social withdrawal) or result in disturbed sleep and irritability. Not surprisingly, anxiety may be directed toward the fate of the limb that will be removed,¹⁶ as well as about the prospect of phantom limb pain, which many patients (who know of other amputees) may be familiar with. Intense sensitivity to the perceived negative attitudes of others toward people with disabilities may also be present, and this may initially be revealed by help-rejecting behavior or expressions of indifference to questions related to what level of function to expect.¹⁶

Acceptance may be facilitated by contact with a religious figure (such as a hospital chaplain). For others, visualization (of positive aspects of life after surgery), self-hypnosis, guided imagery, exercise, postoperative pain relief,¹⁷ and a greater sense of autonomy will facilitate coping during rehabilitation.

For patients whose amputations come in the wake of a sudden trauma or life-threatening infection, there may be little or no time to pass through these stages or to experience more than a few hours of semiconscious, fearful awareness before anesthesia, surgery, and awakening as an amputee. Screening for PTSD and depression should be completed postoperatively and during primary care follow-up visits.¹⁸

Is PTSD Inevitable After Amputation?

Posttraumatic stress disorder appears to be more common in amputees following combat or accidental injury, whereas general rates of PTSD are 20% to 22% in cohorts without amputations.¹⁹ Residual pain is associated with higher rates of anxiety and depression after traumatic amputation, with 1 cohort of elderly amputees endorsing a high level of pain having a 25% prevalence of PTSD symptoms and a 34% prevalence of depressive symp-

toms.²⁰ Posttraumatic stress disorder and chronic, intense psychological distress are also associated with amputations secondary to burns and with traumatic amputations following suicide attempts or accidents.^{18,21} Hand and digit amputations are associated with high levels of distress and PTSD symptoms following visualization of the traumatized body part, suggesting that observation of a patient's initial reactions to looking at the postoperative hand could identify those who will require ongoing psychiatric care.²² Difficult surgeries and patient immobility also appear predictive of PTSD following traumatic injuries from war, work-related tasks, traffic accidents, and recreational activity.²³

In contrast, PTSD is relatively rare (< 5%) among amputees whose surgery follows a chronic illness.²⁴ Therefore, should a patient whose amputation was not the result of trauma report significant PTSD symptoms, such as re-experiencing (e.g., having nightmares or flashbacks), avoidance, or numbing (a type of emotional withdrawal that can overlap with the presentation of depression), a psychiatric referral should be considered for further support.²⁴

Depression following amputation can result from an adjustment reaction to the surgery and to sudden disability; it typically resolves with supportive treatment, involvement in rehabilitation, and the short-term use (i.e., several months) of antidepressants. Less commonly, depression may be secondary to PTSD; there is a 30% chance of comorbidity in the general population.¹⁹ The patient with a pre-existing history of major depressive disorder (MDD) (which has a 10% lifetime prevalence in the general population and up to a 25% lifetime prevalence in women) may have MDD triggered by the amputation. Risk factors for MDD include a young age at time of the amputation,²⁵ pain, neurotic personality style, and poor coping skills.²⁶

What Does Amputation Mean to a Patient, and What Aspects of a Person's Life Affect That Meaning?

The meanings of amputation reflect the diversity of patients and their experience. A previously bed-bound person who sustains an amputation is likely to experience amputation differently from an elite athlete who requires an amputation; amputation can be experienced as an absolute loss or as a challenge. The ability to cope with an amputation will be affected by pain, level of disability, adequacy of cosmesis, cultural issues, presence of social supports, the reactions of caregivers and other loved ones, and a patient's preamputation coping style.²⁷

Pain is common after amputation, as are phantom limb sensations (as first reported by Silas Weir Mitchell in 1871).²⁸ Nearly all patients experience some degree of painless phantom limb sensation, while 55% to 85% experience phantom limb pain. Painless limb sensations

tend to vanish without treatment within 2 to 3 years of the amputation, whereas phantom limb pain often persists. Multiple hypotheses about the source of the pain have been explored (from ectopic discharges [from neuromas that form at the site of amputation and conduct abnormal impulses], to dorsal root ganglion ectopic discharges [that result in more pain under conditions of sympathetic activation, like psychological distress]).²⁹ Because the use of local anesthesia does not always relieve the pain, central nervous system alterations, including opiate receptor down-regulation and reorganization of pain-related processes in the thalamus and brainstem, have been examined. "Pain memories" (first observed in the somatosensory cortex in those with chronic back pain) may also play a role in postamputation pain and in those with neuropathic pain or in those patients undergoing a second amputation.³⁰ Opioid analgesics are important acutely, while antidepressants, anticonvulsants, benzodiazepines, and, more recently, *N*-methyl-D-aspartate antagonists have been tried for chronic pain. Optimal management (including alternate modalities such as biofeedback, transcutaneous electrical nerve stimulation, sympathetic blockade, hypnosis, and acupuncture) of severe amputation-related pain is often delivered by a pain specialist.

The use of well-fitting prosthetics reduces pain³¹ as well as postamputation depression.³² However, eligibility for a prosthesis is only 1 factor that determines level of disability and recovery of function following amputation. Factors that predict poorer function include a previously low level of function (e.g., hemiparesis following strokes), older age, a higher level of leg amputation, obesity, poor balance in the unaffected leg, and memory deficits (affecting the ability to relearn tasks and to gain the most from rehabilitation).³³ At present, it remains unclear whether upper extremity amputations carry greater long-term functional disability than amputation of the lower extremity.³⁴

Special consideration should be given to the paralyzed patient who must undergo amputation. Patients who have sustained a spinal cord injury are likely to present with late-stage PVD due to loss of sensation and immobility, with amputation the only option. They often have problems healing their amputation stumps and develop severe pressure sores refractory to reconstructive surgery; these sores often require multiple revascularization along with the amputation surgery. Indigent patients with spinal cord injuries in nursing homes, without family involvement, may be less likely to receive optimal health care screening (including noninvasive vascular studies of peripheral pulses)³⁵ and therefore may be more vulnerable to feelings of abandonment and anger. These patients may be less prepared to undergo postamputation training and strengthening of the remaining extremities.

Cosmetic appearance appears to play as great a role in psychological sequelae of amputation as does the return of physical function. In patients with digital amputations, regardless of the level of function recovered, those with cosmetic disfigurement are more likely to have PTSD.³⁶

The cultural and personal meanings of amputation, as well as the concepts of “mutilation anxiety” and “coping styles,” should also be considered in trying to understand the patient’s point of view. Cultural meanings of amputation vary with ethnicity and religious beliefs. For example, many Native American tribes hold the physical integrity of the body as sacred and surgery as taboo.³⁷ Black patients may feel robbed of control over their bodies (even invoking memories of historical subjects of unethical research).³⁸ These cultural vulnerabilities must also be viewed in light of cultural resilience. Hispanic patients (in a U.S. study of patients with ESRD) had a higher rate of amputations attributable to DM than either white or black patients, but also appeared to have a survival advantage. This finding could not be accounted for by differences in comorbidities but could be accounted for by cultural and social supports.³⁹

The social meaning of amputation may reflect inadequate access to care for underserved Americans. Ethnic variations in amputation rates and outcomes have been observed, including a higher incidence of proximal amputations for black patients than for white or Hispanic patients.⁴⁰ Yet, some studies have found a greater likelihood that whites will undergo revascularization for infrarenal PVD.⁴¹ Native American patients appear to undergo more amputations than European, Cuban, or East Asian patients with DM.^{42,43} Inequalities in health care access may adversely influence the ability of patients to undergo rehabilitation even when given appropriate services.

Maladaptive coping styles can be classified as overcompensation, surrender, or avoidance.⁴⁴ Overcompensation can take the form of hostility, excessive self-assertion (e.g., by refusing help that is needed), recognition seeking, manipulation, or obsessiveness (e.g., by becoming preoccupied with smaller details of care at the expense of regaining whatever enjoyment of life is still possible). Surrender may take the form of clinging to the sick role and continuing to demand a high level of nursing care, while refusing to undergo rehabilitation. Avoidance may result in psychological withdrawal, addictive self-soothing, or social withdrawal. In contrast, effective coping styles that result from self-efficacy, from using humor, from making plans and visualizing the future, and from actively seeking help to solve problems (as measured by the Way of Coping Check-List-Revised by Lazarus and Folkman, validated by Graziani and co-workers) are correlated with better outcomes following amputation.⁴⁵ In clinical practice, there may be a role for

using this checklist to screen for patients at high risk for adjusting poorly to amputation and for having further negative sequelae.

Mutilation anxiety is closely related to one’s coping style and to the experience of pain. Prior to amputation, as part of the course of prevention (of both chronic vascular disease, as well as accidental injury), mutilation anxiety can be used to motivate patients for self-care and medical compliance. After amputation, mutilation anxiety may be a factor in referring a patient for psychotherapy or treatment of anxiety with medications. Mutilation anxiety may also affect the sexual function of a patient.⁴⁶ Men have reported feeling castrated by amputation, while women are more likely to report feeling sexual guilt and “punished” for some real or imagined transgression by amputation.⁴⁷ For many patients, there is a threatened loss of self and an alteration of body image that interferes with intimacy; up to 76% report decreased sexual function following amputation.⁴⁸ Medical management of fatigue, pain, and cosmesis of the stump can further alleviate these difficulties during the rehabilitation process.

What Does Rehabilitation After Amputation Entail, and What Can Be Done to Enhance Resilience in Patients?

Treatment after amputation involves planning a rehabilitation regimen (even prior to the surgery), managing the immediate postoperative period, planning for an appropriate level of care after discharge, and educating the patient and family to prevent complications.

A rehabilitation regimen includes upper extremity strengthening for lower extremity amputations, transfer training, crutch walking or training in the use of a walker, and evaluation for equipment that may be needed at home (including a wheelchair and a bench for bathing safely). Prosthetic training is also given if the patient is eligible for a prosthetic and has the energy to learn to use it. Such a regimen needs to be tailored to the patient’s motivation and capacity; the more actively engaged the patient can become even prior to the surgery, the better the post-amputation prognosis he or she may have.⁴⁹

Discharge planning includes a home safety evaluation by occupational therapy and discussion with the patient and his or her family about what the patient’s living situation can accommodate. It is important to include a discussion of the timeline of expected discharge in this process so that the patient is mentally prepared to leave the hospital after surgery and has activities or social contacts planned.

Management during the immediate postoperative period includes pain management, psychological support, proper positioning of the residual limb (including elevation to prevent limb edema), evaluation of the limb dressing and placement of a cast, and inspection of sutures. The discomfort that can be associated with wearing a cast

should be explained to the patient as necessary in the prevention of contractures, which can ultimately compromise mobility.⁴⁹

Education of patients and their families is aimed at the care and prevention of complications; it includes attention to limb care and inspection, limb wrapping, prosthetic care, stump care, foot care, and emergency care and monitoring for early signs of infection. Patient inspection of the limb is particularly important if the patient has a prosthesis, as this should not be done if there is any possibility of infection.⁴⁹ Limb wrapping often needs to be done several times a day. The prosthetic will require daily cleaning and inspection to prevent infection and to allow for maximal use. Stump socks must be scrupulously maintained to avoid risk to the site. Finally, preventive foot care (often with involvement of a podiatrist), as well as learning to recognize indications for emergency care, are important aspects for the prevention of a second amputation, for which lower extremity unilateral amputees are at high risk.⁴⁹

Important ways in which the resilience of amputees can be enhanced include building up social supports and caregiver resilience; individual psychotherapy, psychopharmacologic treatment, and reinforcement of the positive coping styles; and treatment of preexisting psychiatric disorders (which carry a poor prognosis for postamputation survival and function).

In addition to utilizing cultural resilience (involving the patient's ethnic and religious community), social support may come from national organizations (such as ParaOlympics and the Amputee Coalition, each of which has support groups for patients and resources for caregivers to prevent feeling overwhelmed). The patient can be empowered to draw on these resources through psychiatric referral or treatment of anxiety and depression by primary care physicians. Employment programs for combat veterans who are amputees may also be an important resource.

Treatment of psychiatric illness that precedes amputation can carry benefits for the rehabilitation process. Psychiatric causes of amputation range from the extremely rare to the common. Rare causes include psychotic disorders (in which auto-amputation may occur as the result of depressed mood or delusional thinking). The emergency department (likely the first place the patient is evaluated), with an opportunity for interdisciplinary work (between surgery and psychiatry), can improve outcomes following replantation.⁵⁰ Rarely, auto-amputation (e.g., secondary to the desire to be an amputee and having a "body integrity disorder") occurs; medicolegal evaluations are crucial for these patients, who may request procedures at general surgery practice clinics.⁵¹ Failed suicide attempts with resultant amputation may present particular challenges for successful rehabilitation, and psychiatric hospital-

ization as well as intensive outpatient treatment may be indicated.

More common psychiatric causes of amputation include self-neglect (e.g., from medical noncompliance). Self-neglect most often results from untreated depression, which has also been correlated with higher rates and greater severity of cardiovascular disease.⁵² Progressive disability, such as Ms. A's blindness, may be viewed as a marker for untreated depression and addressed through encouraging use of social supports and special services. Health care prevention of such outcomes (such as amputation in primary care), while appropriately focused on DM management, smoking cessation, obesity interventions, optimization of medical management, and other risk reductions through healthy lifestyle changes, should also include screening of and treatment for depression and anxiety. Through a coordinated approach that begins in prevention and ends in successful rehabilitation following amputation, successful coping, good function, and enhanced quality of life are possible and should be presented to patients as realistic goals.

REFERENCES

1. Cutson TM, Bongiorni DR. Rehabilitation of the older lower limb amputee: a brief review. *J Am Geriatr Soc* 1996;44:1388-1393
2. Bradley L, Kirker SGB. Secondary prevention of arteriosclerosis in lower limb vascular amputees: a missed opportunity. *Eur J Vasc Endovasc Surg* 2006;32:491-493
3. Rudolph D. Limb loss in the elderly peripheral vascular disease patient. *J Vasc Nurs* 1992;10:8-13
4. Bodily K, Burgess E. Contralateral limb and patient survival after leg amputations. *Am J Surg* 1983;146:280-282
5. Eggers PW, Gohdes D, Pugh J. Non-traumatic lower extremity amputations in the Medicare end-stage renal disease population. *Kidney Int* 1999;56:1524-1533
6. O'Hare A, Johansen K. Lower-extremity peripheral arterial disease among patients with end-stage renal disease. *J Am Soc Nephrol* 2001;12:2838-2847
7. Armstrong DG, Lavery LA, van Houtum WH, et al. The impact of gender on amputation. *J Foot Ankle Surg* 1997;36:66-69
8. Feinglass J, Brown JL, LoSasso A, et al. Rates of lower extremity amputation and arterial reconstruction in the United States, 1979 to 1996. *Am J Public Health* 1999;89:1222-1227
9. Lacroix P, Aboyans V, Medeau L, et al. Long term survival of elderly amputated vascular patients. *Arch Mal Coeur Vaiss* 2000;93:1189-1193
10. Kwan MK, Saw A, Chee EK, et al. Necrotizing fasciitis of the lower limb: an outcome study of surgical treatment. *Med J Malaysia* 2006; 61(suppl A):17-20
11. Huynh TT, Pham M, Griffin LW, et al. Management of distal femoral and popliteal arterial injuries: an update. *Am J Surg* 2006;192:773-778
12. Starnes BW, Beekley AC, Sebesta JH, et al. Extremity vascular injuries on the battlefield: tips for surgeons deploying to war. *J Trauma* 2006; 60:432-442
13. Braunwald E, Fauci AS, Kasper DL, et al, eds. *Harrison's Principles of Internal Medicine*. 15th ed. New York, NY: McGraw-Hill; 2001
14. Parkes CM. Psycho-social transitions: comparison between reactions to loss of a limb and loss of a spouse. *Br J Psychiatry* 1975;127:204-210
15. Kubler-Ross E. *On Death and Dying*. New York, NY: Simon & Schuster; 1969
16. Noble D, Price DB, Gilder R. Psychiatric disturbances following amputation. *Am J Psychiatry* 1954;110:609-613
17. Lobe TE. Perioperative hypnosis reduces hospitalization in patients undergoing the nuss procedure for pectus excavatum. *J Laparoendosc*

- Adv Surg Tech A 2006;16:639–642
18. Fukunishi I, Sasaki K, Chishima Y, et al. Emotional disturbances in trauma patients during the rehabilitation phase. *Gen Hosp Psychiatry* 1996;18:121–127
 19. Breslau N. The epidemiology of posttraumatic stress disorder: what is the extent of the problem? *J Clin Psychiatry* 2001;62(suppl 17):16–22
 20. Desmond DM, MacLachlan M. Affective distress and amputation-related pain among older men with long-term, traumatic limb amputations. *J Pain Symptom Manage* 2006;31:362–368
 21. MacLean A, O'Neill AM, Pachter HL, et al. Devastating consequences of subway accidents: traumatic amputations. *Am Surg* 2006;72:74–76
 22. Gustafsson M, Amilon A, Ahlstrom G. Trauma-related distress and mood disorders in the early stage of an acute traumatic hand injury. *J Hand Surg [Br]* 2003;28:332–338
 23. Opalic P, Lesic A. Investigation of psychopathological state of patients depending on specific clinical characteristics of physical trauma. *Panminerva Medica* 2002;44:11–17
 24. Cavanagh SR, Shin LM, Karamouz N, et al. Psychiatric and emotional sequelae of surgical amputation. *Psychosomatics* 2006;47:459–464
 25. Burger H, Marinček C. The life style of young persons after lower limb amputation caused by injury. *Prosthet Orthot Int* 1997;21:35–39
 26. Mitchell SW. Phantom limbs. *Lipincott's Magazine Popular Lit Sci* 1871;366:563–569
 27. Lai AM, Stanish WD, Stanish HI. The young athlete with physical challenges. *Clin Sports Med* 2000;19:793–819
 28. Badura-Brzoza K, Matysiakiewicz J, Piegza M, et al. Sociodemographic factors and their influence on anxiety and depression in patients after limb amputation. *Psychiatr Pol* 2006;40:335–345
 29. Flor H, Nikolajsen L, Staehelin Jensen T. Phantom limb pain: a case of maladaptive CNS plasticity? *Nat Rev Neurosci* 2006;7:873–881
 30. Katz J, Melzack R. Pain “memories” in phantom limbs: review and clinical observations. *Pain* 1990;43:319–336
 31. Esquenazi A, Meier RH. Rehabilitation in limb deficiency, 4: limb amputation. *Arch Phys Med Rehabil* 1996;77(suppl 3):S18–S28
 32. Cansever A, Uzun O, Yildiz C, et al. Depression in men with traumatic lower part amputation: a comparison to men with surgical lower part amputation. *Mil Med* 2003;168:106–109
 33. Schoppen T, Boonstra A, Groothoff JW, et al. Physical, mental and social predictors of functional outcome to unilateral lower-limb amputees. *Arch Phys Med Rehabil* 2003;84:803–811
 34. Ebrahimzadeh MH, Fattahi AS, Nejad AB. Long term follow up of Iranian veteran upper extremity amputees from the Iran-Iraq war (1980–1988). *J Trauma* 2006;61:886–888
 35. Yokoo KM, Kronon M, Lewis VL, et al. Peripheral vascular disease in spinal cord injury patients: a difficult diagnosis. *Ann Plast Surg* 1996;37:495–499
 36. Fukunishi I. Relationship of cosmetic disfigurement to the severity of posttraumatic stress disorder in burn injury or digital amputation. *Psychother Psychosom* 1999;68:82–86
 37. Alvord LA. *The Scalpel and the Silver Bear: The First Navajo Woman Surgeon Combines Western Medicine and Traditional Healing*. New York, NY: Bantam; 2000
 38. Jones J. *Bad Blood: The Tuskegee Syphilis Experiment*. New York, NY: Free Press; 1993
 39. Smith DP, Bradshaw BS. Rethinking the Hispanic paradox: death rates and life expectancy for US non-Hispanic white and Hispanic populations. *Am J Public Health* 2006;96:1686–1692
 40. Lavery LA, Ashry HR, van Houtum W, et al. Variation in the incidence and proportion of diabetes-related amputations in minorities. *Diabetes Care* 1996;19:48–52
 41. Brothers TE, Robison JG, Sutherland SE, et al. Racial differences in operation for peripheral vascular disease: results of a population-based study. *Cardiovasc Surg* 1997;5:26–31
 42. Chaturvedi N, Stevens LK, Fuller JH, et al. Risk factors, ethnic differences and mortality associated with lower-extremity gangrene and amputation in diabetes. The WHO Multinational Study of Vascular Disease in Diabetes. *Diabetologia* 2001;44(suppl 2):S65–S71
 43. The Global Lower Extremity Amputation Study Group. Epidemiology of lower extremity amputation in centers in Europe, North America and East Asia. *Br J Surg* 2000;87:328–337
 44. Desmond DM. Coping, affective distress and psychosocial adjustment among people with traumatic upper limb amputations. *J Psychosom Res* 2007;62:15–21
 45. Grossi G. Coping and emotional distress in a sample of Swedish unemployed. *Scand J Psychol* 1999;40:157–165
 46. Shell JA, Miller ME. The cancer amputee and sexuality. *Orthop Nurs* 1999;18:53–57, 62–64
 47. Hogan R. *Human Sexuality*. Norwalk, Conn: Appleton-Century-Crofts; 1985
 48. Williamson GM, Walters AS. Perceived impact of amputation on sexual activity: a study of adult amputees. *J Sex Res* 1996;33:221–230
 49. Nevue V, Spearbeck K. Care of the patient with lower limb extremity amputation: above the knee or below the knee. In: Maguire P, ed. *Manual of Patient Care Standards*. Gaithersburg, Md: Aspen; 1998:1–7
 50. Schlozman SC. Upper-extremity self-amputation and replantation: 2 case reports and a review of the literature. *J Clin Psychiatry* 1998;59:681–686
 51. Wise TN, Kalyanam RC. Amputee fetishism and genital mutilation: case report and literature review. *J Sex Marital Ther* 2000;26:339–344
 52. Van der Kooy K, van Hout H, Marwijk H, et al. Depression and the risk for cardiovascular diseases: systematic review and meta analysis [published online ahead of print Jan 19, 2007]. *Nat Med*. doi:10.1002/gps.1723