

Combat Related Amputations

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Amputations related to combat injuries as well as the challenges involved in rehabilitation are discussed. The focus is on blast related events resulting in the loss of body parts. This paper outlines the areas of etiology, severity, and complications related to these types of amputations. The author discusses the rehabilitation and vocational impact for the military population in question and also lists community resources for the amputee.

Amputation is the removal or loss of either part or all of a limb either by trauma or surgery or by congenital defect. According to statistics, in 2008 there were approximately 1.7 million people living with limb loss in the United States (Amputee Coalition of America [ACA], 2008). Amputations occur due to accident related trauma, poor blood flow to the limb usually due to vascular disease, infections that cannot be healed, tumors, burns and frostbite, and wounds that do not heal (Ma & Zieve, 2008). Amputations due to vascular disease accounted for 82 percent of limb loss from 1988-1996 (ACA). Of particular importance to the combat veteran in today's population is the instance of trauma related amputations. Between January 2001 and January 2010, since the United States began its efforts in the war on terrorism, more than 950 military service members have sustained major limb amputations associated with military operations (Pasquina, 2010). Due to medical innovations and advanced body armor technology, over 90 percent of military personnel injured in the ongoing conflict survive with injuries that would have been fatal in previous wars (Frain, Bishop, & Bethel, 2010). "It is estimated that for every member killed, there are 16 more wounded that will return to the United States with some form of disability, often polytraumas, or brain injury in addition to other body parts or systems resulting in physical, cognitive, psychological, or other psychosocial impairments and functional disability" (Frain et al., 2010, p. 13).

History

Amputations date back to the beginning of mankind but became more common as medicine advanced to support healing afterward. Hippocrates described the use of ligatures to control bleeding and this method was reintroduced in 1529 by Ambroise Pare, a French military surgeon and amputations became more used as a life saving technique (Wilson, 2002). More advances that increased the use of amputation and

made it easier to survive were: the tourniquet developed in 1674 by Morel, and the introduction of antiseptic technique by Lord Lister in 1867 (Wilson).

The development and advancement of prosthetics further improved the capabilities of amputees. The dissatisfaction of amputees toward the end of World War II prompted the National Academy of Sciences (NAS) to begin a program known as the Artificial Limb Program, which was the first collaboration between medicine and engineering, to produce adequate and innovative designs for artificial limbs (Wilson, 2002). Today, there have been even more advances in the areas of prosthetics, due to the development of new technology, substitutions of materials, new computer aided design, and significant advances in the areas of socket design and alignment (Wilson).

Etiology, Severity and Complications

The majority of severe injuries result from a blast (Ebrahimzadeh & Hariri, 2009). In the past the blast was from explosive munitions such as land mines, bombs, and grenades. According to Pasquina (2010) today the majority of trauma comes from improvised explosive devices (IED). These blasts cause wounds that are extensively contaminated and involve massive soft-tissue disruption (Pasquina, 2010). The blast-related polytrauma from one IED requires an average of five surgeries (Frain et al., 2010). Non-amputated limbs are often injured as well and create multiple rehabilitation challenges (Pasquina). The severity of the disability is based on levels of amputation which is classified according to their location relative to the nearest joint (Clawson, 2009). The levels are: partial foot, Syme, below knee (B/K), knee disarticulation (K/D), above knee (A/K), hip disarticulation (H/D), partial hand, wrist disarticulation (W/D), below elbow (B/E), elbow disarticulation (E/D), above elbow (A/E), shoulder disarticulation (S/D) (Clawson). Surgeons work collaboratively to preserve as much of the limb as

possible, including saving joints such as the elbow and knee to help maximize long term functional outcomes (Pasquina).

The severity of the disability is also directly related to the functional limitations. There may be mobility impairment including walking, lifting, standing, climbing, squatting, reaching, bending, and kneeling, especially if the amputation occurs to a lower limb (Clawson, 2009). There may be motivity impairment including: carrying, manual dexterity, absence of feeling and sensation in a prosthetic device, eye-hand coordination, gripping and grasping (Clawson). There may be debilitation and loss of strength, atypical appearance including grieving and adaptation to changed body image, and hidden impairments due to psychological issues associated with an amputation (Clawson). Complications that may occur are edema, ulceration, contracture, infection, and pain (Clawson). Pain may include residual limb pain, and phantom limb pain that have long term debilitating effects (Ebrahimzadeh & Hariri, 2009). Another type of pain not well explored in amputations is back pain. Back pain after limb amputation is common and may become chronic (Ebrahimzadeh & Hariri). It may be attributed to level of amputation, biomechanical variables, muscle atrophy, crutch walking, or to postural muscles functioning asymmetrically (Ebrahimzadeh & Hariri). Severe debilitating pain may also lead to drug addiction in the veteran population which further complicates rehabilitation (Ebrahimzadeh & Hariri). The type and quality of soft-tissue coverage, preservation of the knee joint, residual limb length, and design of prosthesis are important factors leading to good outcomes in rehabilitation (Mackensie, 2004). Since veterans with trauma related amputations often have poor soft tissue quality due to contamination it may take them longer to heal. "The actual level of amputation is often not defined until weeks after the injury to allow for adequate wound debridement to ensure tissue vitality" (Pasquina, 2010, para. 3).

Psychological problems are another significant source of complications for war amputees. Depressive symptoms and post traumatic stress disorder (PTSD) are common effects of combat related amputations (Frain et al., 2010). One-third of veterans with combat-related amputations also suffer from an associated traumatic brain injury (TBI) and one forth is also diagnosed with PTSD (Pasquina, 2010). Psychological disabilities decrease an individual's ability to cope with physical disability and therefore hinder rehabilitation (Ebrahimzadeh & Hariri, 2009).

Rehabilitation and Vocational Impact

In response to the unique needs of the military population with limb loss, The Department of Defense established three main Centers of Excellence (COE's)

for Amputee care in Washington, DC, San Antonio, TX, and San Diego, CA (Pasquina, 2010). Through a holistic/comprehensive approach, veterans receive care from multidisciplinary teams which include physical medicine and rehabilitation, physical therapy, occupational therapy, orthopedics, prosthetics and nursing, pain management and behavioral health experts, vocational rehabilitation specialists, peer-support visitor, case managers and recreational and sports groups (Pasquina). The emphasis is on aggressive early rehabilitation. One main goal of rehabilitation professionals is to facilitate coping with amputation. Coping styles of amputees are similar to other groups of people dealing with illness generally including active coping/problem solving perspectives versus denial, optimism versus pessimism and seeking external support versus internally oriented acceptance (Pramuka, MacAulay, Spornier, & McCue, 2009). Rehabilitation counselors can provide social support by addressing veteran's concerns in a supportive manner until the veteran has become comfortable with their many decisions.

The vocational rehabilitation for the combat veteran entails: returning an individual to gainful employment through a complex process of assessment, counseling support services and retraining that begins shortly after the onset of the disability (Pramuka et al., 2009). The Soldiers Rehabilitation Act was passed in congress in 1918 and it required the vocational education for returning World War I soldiers who had disabilities (Pramuka et al.). Likewise, the Disabled Veterans Act of 1943, the Veterans Readjustment Act of 1952, and The Rehabilitation Act of 1973 continuously increased the benefits and educational opportunities for veterans and civilians (Pramuka et al.). The Department of Veterans Affairs Veterans Benefits Administration's Vocational Rehabilitation and Employment (VR&E) service delivers Vocational Rehabilitation to veterans with service-connected disabilities (Pasquina, 2010). Today's veteran with an amputation looks different than the civilian amputee demographic. More than 85 percent of the service-members with trauma related combat amputations are under the age of 35, compared to the civilian population with 81 percent over the age of 44 whose amputations are more commonly disease related (Pasquina). Being younger age at the time of amputation has been shown to have a positive relationship with return to productive employment; this is one positive outlook for these combat veterans (Crisp, 2005).

Because combat amputees were on active duty at the time of their injury, they tend to be young, fit, healthy, and oriented to physical activity, competition, and independence. These pre-injury characteristics imply significant motivation to return to employment (Pramuka et al., 2009). However, the combat veteran also has many unique obstacles to overcome. Accord-

ing to Pramuka et al. (2009) there are five areas for consideration.

- The veteran has to change their outlook from the "We" mentality of the service member who is part of a bigger group, back to an "I" and re-prioritize the self in order to plan for individual goals.
- The cultural background of the service member has to be considered. Some service members speak English as their second language, which may present a barrier to an academically oriented training program.
- The individual's strengths and limitations needs to be considered. The current etiology of limb loss due to explosion often includes numerous additional injuries such as spinal cord injury, burns, orthopedic injuries, and head trauma. These injuries may supersede amputation as the primary limiting factors and need to be addressed in identifying future employment opportunities.
- The issue of the feasibility of transferring past work skills to future employment options must be considered. Many job duties are specific to military needs and have no clear parallel in civilian settings. Some service members may have chosen the military path due to a lack of other vocational direction and have no other work/education to pull from. These individuals may need extensive evaluation and exploration to determine an employment direction.
- The location of employment needs to be explored. Because many members with limb loss find proximity to a VA hospital a necessity due to ongoing needs for rehabilitation, therapy, and modifications through VA prosthetics services, location of jobs is an important factor in choosing long-term employment.

Vocational Rehabilitation begins early in the rehabilitative process for combat veterans and development of a rehabilitation plan is established. According to Pramuka et al. (2009), the VR plan includes three main components and should begin with an assessment of a baseline level of independent function, which includes basic activities of daily living, the ability to maintain attention and endurance equivalent to a work-oriented schedule, and emotional status. To address these issues the VR plan often includes a detailed list of prevocational therapeutic activities involving outpatient rehabilitation, counseling, and community based reentry programs. A second aspect of the plan should include the functional assessment of the strengths, ambulation, motor and sensory skills to determine the veteran's specific levels of physical ability as related to work demands. A third component of the plan is career guidance and exploration of the individual's vocational goals and choices about future employment and training. VR may provide fund-

ing for training or and educational program to prepare the veteran for a new career, counseling and learning supports for the new learning environment, environmental modifications and other strategies that facilitates employment (Pramuka et al., 2009). Because barriers may arise unexpectedly, VR follow up contact is maintained in case a need arises to reassess or redefine the plan.

Future Research

In today's era of modern science and advanced technology, the care for individuals with amputations is being revolutionized through collaboration across different disciplines. According to Pasquina (2010), it is important for clinicians to identify and communicate the functional needs of patients to engineers, biologists, computer scientists, and systems engineers to achieve common goals. In order to further advance the field of rehabilitation counseling, a mutual sharing of ideas between universities, federal agencies and industry partners will be necessary (Pasquina, 2010). Because combat veterans face their own special challenges, there needs to be more research aimed at addressing these challenges specifically. The area of polytraumas is one such area which needs to be investigated in order to map out the specific interactions of the multiple conditions in order to better predict and plan for rehabilitation needs.

Community Resources

There are many community resources available to veterans and their families. In a paper titled "Resources for wounded warriors with major traumatic limb loss" (McFarland, Choppa, Betz, Pruden, & Reiber, 2010) authors identify more than 87 internet resources listed with a complete description of the sites and organizations that sponsor them. Here is an abbreviated list of resources in Table 1.

Discussion

Veterans with combat related amputations compose a special population with specialized needs. In addition to the difficulties associated with any amputation, the trauma related from the blasts associated with military conflicts complicate the physical and psychological rehabilitation of this amputee population. Also, the interactions of multiple traumas present barriers for rehabilitation. The Department of Defense has established specially designed and equipped facilities to assist this population through an aggressive early rehabilitative approach with multidisciplinary teams. Despite the many barriers facing this population, rehabilitation outlook is positive due to inherit charac-

Table 1*Resources for Veterans with Amputations*

Resource/Website	Description
Hope for the warriors http://www.hopeforthewarriors.org	Non-profit organization which provides programs such as: recreational, financial, support groups, rehabilitation centers
VA Prosthetics and Sensory Aids Service http://www.prosthetics.va.gov	Information on prosthetic devices and adaptive equipment for VA healthcare beneficiaries
VA Vocational Rehabilitation and Employment http://www.vba.va.gov/bln/vre/	Provides vocational rehabilitation services for veterans with service connected disabilities
American Veterans http://www.amvets.org	Volunteer organization which provides community services to veterans and helps them apply for benefits
Disabled American Veterans http://www.dav.org	Nonprofit organization which provides free support to veterans including educating veterans about their benefits and helping them apply for them
Amputee Coalition of America http://www.amputee-coalition.org	National nonprofit consumer educational organization representing people with amputations
American Orthotic & Prosthetic Association http://www.aopanet.org	For profit trade association with services and products for orthotic and prosthetic professionals
Adaptive Sports Foundation http://www.adaptivesportsfoundation.org	Nonprofit organization that provides winter and summer sports instruction to children and adults with disabilities

teristics of today's military members who are strongly motivated toward independence. The VR plan is an important piece in the rehabilitation process and follow up can be an ongoing process. The numbers of military members returning from the ongoing conflict with disabilities is continuing to rise and the need for continued research and collaboration is critical to meet their needs.

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