



Late amputation may not reduce complications or improve mental health in combat-related, lower extremity limb salvage patients[☆]



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ABSTRACT

Introduction: Following severe lower extremity trauma, patients who undergo limb reconstruction and amputations both endure frequent complications and mental health sequelae. The purpose of this study is to assess the extent to which late amputation following a period of limb salvage impacts the evolution of the clinical variables that can affect the patient's perception of his or her limb: ongoing limb associated complications and mental health conditions.

Patients and methods: A case series of US service members who sustained a late major extremity amputation from September 2001 through July 2011 were analysed. Pre- and post-amputation complications, mental health conditions, and reason(s) for desiring amputation were recorded.

Results: Forty-four amputees with detailed demographic, injury and treatment data were identified. The most common reasons for desiring a late amputation were pain and being dissatisfied with the function of the salvage limb. An average of 3.2 (range 1–10) complications were reported per amputee prior to undergoing late amputation and an average of 1.8 (range 0–5) complications reported afterwards. The most common complication prior to and after late amputation was soft tissue infection (24 (17%) and 9 (22%), respectively). Twenty-nine (64%) late amputees were diagnosed with a mental health condition prior to undergoing their amputation and 27 (61%) late amputees were diagnosed with mental conditions after late amputation. Only three of the 15 patients who did not have a mental health condition documented prior to their late amputation remained free of a documented mental health condition after the amputation.

Discussion: Ongoing complications and mental health conditions can affect how a patient perceives and copes with his or her limb following severe trauma. Patient dissatisfaction following limb reconstruction can influence the decision to undergo a late amputation. Patients with a severe, combat related lower extremity injury that are undergoing limb salvage may not have a reduction in their overall complication rate, a resolution of specific complications or an improvement of their mental health after undergoing late amputation.

Conclusion: Surgeons caring for limb salvage patients should counsel appropriately when managing expectations for a patient who desires a late amputation.

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Introduction

The burden of musculoskeletal injuries and, in particular, amputations is well documented [1–5]. In spite of this, there is a relative lack of reporting on the course of those patients that undergo amputation at or after 90 days from their original injury [6–8]. Efforts focused on salvaging severely injured extremities often times involve an intensive, multidisciplinary expenditure of resources that seeks to address complicated clinical scenarios [4,9–12]. This fact, combined with the potential morbidity of

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delayed amputation procedures, continues to compel initiatives to better understand the clinical factors that determine the lasting viability of severely injured extremities [13,14].

Recent literature has shown that both limb salvage patients and late amputees experience short and long-term extremity complications [15–18]. Additionally, it appears that both limb salvage patients and amputees both endure adverse mental health outcomes secondary to their injuries [4,15,19,20]. What remains unknown, however, is the extent to which a late amputation decreases the likelihood of complications encountered in this population. In the setting of a patient who is unsatisfied with his or her salvaged limb, the understanding of late amputation outcomes would be important for orthopaedic surgeons to adequately counsel these patient in order to more appropriately manage their expectations following a late amputation. The purpose of this study was to assess the extent to which late amputation impacts the evolution of the clinical variables that can affect the patient's perception of his or her limb: ongoing limb associated complications and mental health conditions. This retrospective case series was conducted under a protocol approved by our institutional review board.

Patients and methods

A database of all military amputations (Extremity Trauma and Amputation Center of Excellence, Fort Sam Houston, TX) was queried to identify all major extremity amputations (MEA) sustained by service members that occurred between October 1, 2001 and July 30, 2011. This database contains demographic information on all US Military amputees injured during recent military conflicts who were treated at military treatment facilities. MEA was defined as an amputation proximal to the carpals or tarsals of a limb and a late amputation was determined to be any amputation that occurred 90 days or more after injury. These names were then cross-referenced within the Department of Defense Trauma Registry ((DoDTR) Fort Sam Houston, TX). This registry contains medical treatment data on service members that is obtained from the battlefield and each treatment facility where they are treated. This generated a potential subject list from the above mentioned period of combat.

The final case series was derived from the potential list based on two inclusion criteria. First, the electronic medical records of each subject were evaluated for documentation of pre and post amputation treatment, function, complications and mental health conditions. Subjects were potentially included if the medical documentation was adequate to delineate a treatment and complication timeline. Secondly, subjects with adequate medical records were included if the documentation indicated that a portion of the driving force behind the decision for late amputation was the subject's dissatisfaction with his or her salvaged limb. This was done in order to exclude patients who underwent amputation solely for a medically indicated reason such as infection in lieu of patients who underwent amputation in an attempt to improve function, pain, and/or limb satisfaction.

After accounting for these exclusions, 44 late amputees were further examined. Simple statistics are used to describe the frequency of pre- and post-amputation complications and mental health disorders.

Results

These amputees were typically young males with a mean age of 26 (SEM 0.84, range 20–42 years old). The majority (70%) of these amputees was injured via explosive device and sustained a penetrating injury (54%). The mean Injury Severity Score (ISS)

Table 1

Demographic information for all patients in this study.

Demographic information		
Injury type		
Blunt	16	37%
Burn	5	11%
Penetrating	23	52%
Mechanism of injury		
GSW/firearm	10	24%
Burn	1	2%
Explosive device	31	70%
Fall	1	2%
MVC	1	2%

GSW: gunshot wound; MVC: motor vehicle collision.

for these amputees was 14.8 (SEM 1.4, range 1–50). The injury types and mechanisms are found in Table 1. The mean number of days from injury to amputation was 576 days (SEM 56, range 96–1696 days). Thirty of the 44 subjects (68%) had entered in the military medical evaluation board process pending medical discharge from the service; the mean number of days from to initiation of the medical board process which reflects the limitation of follow up available in the military electronic medical record was 996 days (SEM 73, range 485–1785 days). The levels of amputation among late amputees is summarised in Fig. 1, and the most common level of late amputation occurred at the transtibial level (33, 75%).

The most common reasons documented in the medical record for late amputees desiring amputation were pain associated with their salvaged limb (31 amputees, 69%) and being unsatisfied with their functional ability or range of motion (26 amputees, 58%). There were an average of 2.4 reasons for desiring a late amputation per amputee and a list of all patient reported reasons for wanting to undergo an amputation is presented in Table 2.

There were 138 total complications that were documented by health care providers in the late amputees prior to undergoing their amputation (mean 3.2 per amputee, SEM 0.27, range 1–10 complications). The most common complications prior to late amputation were soft tissue infection (24, 17%), joint pain (17, 23%), chronic regional pain syndrome, and nonunion (16, 12% each). The mean number of complications per amputee after undergoing late amputation was 1.8 (SEM 0.13, range 0–5). The most common complications sustained after undergoing their late amputation were soft tissue infection (9, 22%), heterotopic ossification (7, 17%), arthritis/joint pain, osteomyelitis and wound dehiscence (5, 12% each). The complete list of complications reported before and after late amputation is summarised in Table 3. The pre-amputation complications associated with a longer time to prosthesis fitting after amputation were heterotopic ossification (mean 182 days), wound dehiscence (149 days) and soft tissue infection (mean 148 days). Among the eleven patients that required revision amputation, all revisions were undertaken to address infection, with four cases involving the soft tissues (36%) and seven cases of osteomyelitis (64%). Details pertaining to mental health characteristics in this cohort are presented in Table 4. Twenty-nine (64%) late amputees were diagnosed with a mental health condition prior to undergoing their amputation and 27 (61%) late amputees were diagnosed with mental conditions diagnosed after late amputation. The mental health conditions that were present prior to the late amputation were typically not the same as the mental health conditions present after the late amputation. Only three of the 15 patients who did not have a mental health condition documented prior to their late amputation remained free of a documented mental health condition after the amputation.

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