



Comparing Weight Bearing and Patient Satisfaction Between the Ertl Transtibial Amputation and the Traditional Below Knee Amputation

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Background: High energy or blast injuries have contributed to the dramatic increase in the number of amputations performed on military personnel in the past several years. A large percentage of civilian amputations occur secondary to diabetes and subsequent osteomyelitis. Unfortunately, there is significant functional loss and morbidity associated with lower extremity amputations. In an effort to mitigate potential long-term complications and improve patient satisfaction, we are evaluating different surgical options. The Ertl osteomyoplastic transtibial amputation (Ertl) creates a synostosis between the tibia and the fibula. The medullary canal is also closed to help restore endosteal blood supply gradients. The traditional posterior myofascialcutaneous amputation does not address bony stability. The null hypothesis of our study is there is no difference between patient satisfaction and end weight bearing capacity between the two procedures.

Methods: Our study was conducted on patients with a transtibial amputation. Each patient completed the Short Musculoskeletal Function Assessment Injury and Arthritis Survey (SMFA). Measurements of the patients' weight-bearing pressure were recorded three times using the X-Sensor© pressure mapping system. The average pressure and stump surface area were recorded. Pain was documented during testing with the visual analog scale (VAS). Knee range of motion and limb circumference was measured prior to weight bearing testing. A two-sample t-test was utilized to detect significant differences ($p < 0.05$).

Results: 43 patients have been enrolled (24 Ertl and 19 standard) and were matched according to BMI. Ertl amputees could bear more average pressure over their residual limb, as compared to those having standard amputations ($p < 0.05$). The surface area of the residual limb was significantly increased in the Ertl amputees ($p < 0.05$). The limb circumference trended larger in the Ertl amputees as well. Ertl amputees had more range of motion of the residual limb with a significant improvement in flexion ($p < 0.05$). There was a significant reduction in pain scores for participants having an Ertl over a standard amputation ($p < 0.05$). Ertl patients scored better on both the bothersome and function SMFA scores ($p < 0.05$).

Discussion: The Ertl amputation procedure allows patients to bear more weight comfortably on their residual limb. Our results illustrate that the Ertl procedure results in significantly larger weight-bearing pressures being tolerated in the amputated limb with significantly lower VAS pain scores. Ertl patients demonstrate better range of motion with their amputated limb. Ertl patients also have more function and feel less hindered by their amputation. Thus, patients receiving an Ertl amputation better tolerate weight bearing on their residual limb, which may facilitate: prosthetic use, perceived comfort, increased functionality, and subsequently more reliable return to pre-amputation level of activity.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.

This may be attributed to the greater surface area, slightly larger limb circumference, diminished motion between the tibia and fibula with weight bearing, or increased intramedullary pressures recorded in yet unpublished data. We believe that the Ertl amputation is a viable alternative to the traditional below knee amputation.