

Oxygen Consumption Testing and Self-Reported Outcomes Following Limb Salvage with Tibio-Calcaneal or Tibio-Talo-Calcaneal Fusion

S. Robert Rozbruch, MD; Polly de Mille; Eugene Borst; Austin T. Fragomen, MD

Contact: rozbruchsr@hss.edu

What was the question? Little is known about the energy expenditure following limb salvage with tibio-calcaneal (TC) or tibio-talo-calcaneal (TTC) fusions and optimization of leg lengths. What is the energy expenditure of patients who have undergone limb salvage with TC or TTC fusions? What are the patient self-reported outcomes?

How did you answer the question? Oxygen consumption testing was conducted using a metabolic measurement system. Subjects then selected their usual daily walking speed (UDWS) measured in mi/hr. Four walking trials of 3–8 min duration were conducted. During each walking trial, subjects walked until they attained a steady state heart rate (± 5 heart beats/min) and O₂ consumption (± 150 ml/min) for 3 consecutive minutes. Trials were conducted in a randomized order with gradual adjustment of speed between trials to serve as adjustment time. The four trial speeds were 80%, 100%, 120% of their UDWS, and 2 miles/hour. Steady state oxygen consumption (ml/kg/min) in each condition was compared to predicted values based on the American College for Sports Medicine metabolic equation for walking. Deviations from predicted values were reported for each condition. Patient reported outcome scores were also collected. Visual analog score (VAS) was obtained after traversing stairs and scaled at 1–10.

What are the results? At the UDWS of 1.9 ± 0.4 mi/hr., the O₂ consumption was 10.6 ± 1.9 ml/kg/min and this was $23.8 \pm 12.9\%$ higher than normal. At 80% of UDWS of 1.5 ± 0.3 mi/hr., the O₂ consumption was 9.3 ± 1.6 ml/kg/min, and this was $24 \pm 13.5\%$ higher than normal. At 120% of UDWS of 2.3 ± 0.5 mi/hr., the O₂ consumption was 11.2 ± 1.7 ml/kg/min, and this was $22.5 \pm 13.6\%$ higher than normal. At a standardized 2 mi/hr. speed, O₂ consumption was 10.6 ± 1.3 ml/kg/min, and this was $19.9 \pm 13.9\%$ higher than normal. SF-36 mental component scores were 57 ± 4 and physical component score was 45 ± 13 . The VAS was 1.1 ± 1.6 .

What is your conclusion? Following limb salvage TC or TTC fusion and limb length optimization surgery, the energy expenditure as measured by O₂ consumption was about 10 ml/kg/min which was about 23% above normal. Patients did not have much pain. The mental component score of SF-36 was above normal average and the physical component was only slightly below normal average.