



5.017 Patient Screening and Selection for Bone-Anchored Limb Implantation in Individuals with Transfemoral Amputation: Eligibility Criteria and Risk Factor Analysis

Mohamed Awad, Eric Earley, Danielle Melton, Brecca Gaffney, Cory Christiansen, Jason Stoneback

University of Colorado Anschutz Medical Campus, Denver, USA

BACKGROUND

Osseointegration of a bone-anchored limb (BAL) is an emerging rehabilitation technique offering significant advantages over traditional socket prostheses. Despite these benefits, the patient screening and selection process for BAL remains underdeveloped, with evidence-based guidelines still in their infancy.

AIM

This study aimed to describe eligibility criteria for BAL implantation by retrospectively evaluating anatomical, physiological, psychological, and lifestyle factors from BAL candidates. Specific objectives included comparing eligible, ineligible, and optimization-required groups, and identifying key factors influencing eligibility.

METHOD

From May 2019 to September 2024, eighty individuals with transfemoral amputations were evaluated as BAL candidates through a multidisciplinary screening approach considering anatomical, physiological, psychological, and lifestyle factors. Screening outcomes for eligible and ineligible candidates were compared to identify between-group differences, with significance set at $\alpha=0.05$. The most common causes of medical holds for optimizing modifiable risk factors were documented.

RESULTS

50 candidates were eligible for BAL implantation and 30 were ineligible. Ineligible candidates had higher body mass ($p=0.004$) and body mass index ($p=0.01$), thinner cortical bone thickness ($p=0.01$), greater pelvic asymmetries ($p=0.04$), and a greater number of lifestyle risk factors such as recreational drug use ($p=0.01$), nicotine use ($p=0.04$), higher alcohol dependency ($p=0.04$), unemployment ($p=0.02$), and cognitive impairment ($p=0.01$) than eligible candidates. Additional factors included lower vitamin D levels ($p=0.04$), elevated C-reactive protein ($p=0.02$), higher white blood cell counts ($p=0.03$), unemployment ($p=0.02$), retained hardware ($p=0.03$), skin ulcers/cellulitis ($p=0.0006$), depression ($p=0.006$), peripheral vascular disease ($p=0.001$), and osteoporosis ($p=0.02$). There were no between-group differences in age ($p=0.3$), residual bone length ($p=0.8$), intramedullary canal diameter ($p=0.1$), number of prior socket prostheses ($p=0.7$), daily wear hours ($p=0.6$), previous residual limb surgeries ($p=0.6$), or soft tissue contracture ($p=0.4$). The primary risk factors deemed to be modifiable by the clinical team included elevated BMI, abnormal laboratory findings, nicotine use, financial or insurance constraints, limited post-BAL care providers, active infection, uncontrolled diabetes ($HbA1c >7\%$), prosthetic component adjustments, ongoing corticosteroid therapy, substance use, conflicting personal or family commitments, and home safety considerations. Non-modifiable factors leading to ineligibility included age, skeletal immaturity, insufficient residual bone for implant anchoring, cognitive impairment, limited implant weight-bearing capacity, permanent medications affecting bone healing, and severe peripheral vascular disease.

DISCUSSION AND CONCLUSION

Our findings highlight the results of structured, patient selection for BAL, potentially informing future research for optimizing patient selection, optimizing outcomes and expanding candidate eligibility as BAL technology advances.

ACKNOWLEDGEMENTS

We acknowledge the clinicians, researchers, and support staff at the University of Colorado Bone-Anchored Limb Research Group