

CORR Insights®: How to Improve Patient Selection in Individuals With Lower Extremity Amputation Using a Bone-anchored Prosthesis

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Where Are We Now?

In recent years, the indications to perform amputations have grown narrower [25]. In trauma care, this is a function of newer techniques that combine biologic reconstructions, improved fixation techniques, a better prevention and/or treatment of infections, and an appropriate use of techniques of orthoplasty [4–6]. In orthopaedic

oncology, the introduction of newer systemic treatments and more sophisticated techniques of reconstruction—including biological reconstructions as well as modular prostheses and 3D-printed prostheses—have likewise reduced the role of ablative surgery [19]. Nonetheless, amputations are still performed and sometimes are appropriate in orthopaedic oncology, in traumatology, as well as in the treatment of some severe limb deformities [25].

The most widely used prostheses for patients who have undergone amputation in the lower limbs are socket-suspended prostheses, and it is well known that patients with these external prostheses experience difficulties and complications related to their sockets, including pain, skin breakdown, and mechanical problems [14, 15, 20, 23], which adversely affect patients' quality of life [17, 22]. For these reasons, a number of innovations pertaining to bone-anchored implants have been developed and explored over the last 3 decades [2, 9, 10, 12, 16, 18, 21].

However, these devices are associated with a number of specific complications and disadvantages [8, 11, 13].

For these reasons it would be important to identify which population of patients may benefit from a bone-anchored prosthesis based on improvements to their health-related quality of life (HRQoL). In this month's issue of *Clinical Orthopaedics and Related Research*®, van Vliet-Blockting et al. [24] address the issue of how to improve patient selection in individuals with lower extremity amputation using a bone-anchored prosthesis. The aim of their study was to identify and propose a reliable tool to identify candidates who may benefit from the use of a bone-anchored prosthesis and achieve improvement in HRQoL. Such information—as the authors note—would be extremely useful for both physicians and patients in the decision-making process between a socket-suspended prosthesis and a bone-anchored one.

The authors found that younger patients with a lower physical generic HRQoL, and those with a traumatic cause of amputation combined with a lower activity level, were more likely to experience a better physical generic HRQoL after treatment with a bone-anchored prosthesis. Patients with amputations related to arterial insufficiency and those with lower prosthetic comfort also were more likely to experience a better disease-specific

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HRQoL. In addition, the authors found that major complications were uncommon after bone-anchored prosthesis treatment at 24 months of follow-up, and that younger and higher functioning patients with a traumatic amputation had the lowest risk of minor complications, while women, older patients, patients with a lower activity level, and older patients with more time since amputation had the highest risk of minor complications. Patients with a higher disease-specific HRQoL had the highest risk of moderate/severe complications. Based on these discoveries, surgeons should be aware of the population with a higher risk of complications and use such information for both choosing the best indications to a bone-anchored prosthesis and planning a closer check of those patients with expected higher incidence of complications.

Where Do We Need To Go?

The authors conclude that association models of generic and disease-specific HRQoL with complications should be validated in a new clinical setting to proceed further in the direction of a possible prediction model useful for a clinical decision in each case. I agree that this would be a great next step.

Studies that evaluate more homogeneous patient populations (same type of amputation, same cause of amputation) might also help. The current study included a broad cross-section—different amputation levels in the lower limb as well as different causes of amputation, including traumatic, oncologic, infectious, dysvascular, congenital, and others—now it's time to go deep. We need to obtain data from other centers on their experiences with bone-anchored prostheses and also compare populations of patients

with amputations who have been using socket-suspended prostheses with those who have received bone-anchored prostheses as their initial prosthesis.

How Do We Get There?

There are two possible ways of acquiring the needed analyses: multicenter studies from experienced centers on socket-suspended and bone-anchored prostheses, or large-cohort prospective studies.

In both kinds of studies, it would be extremely important, as mentioned before, that the analysis of complications and HRQoL be made on a homogeneous series of patients—that is, those with the same level of amputation and the same type of disease. Perhaps van Vliet-Blockting and colleagues [24] could promote such studies in other centers based on their wide experience and by using their study's design and main findings as starting points for further validation studies. Through them, a prediction model could hopefully be achieved and offer a conclusive tool for clinical decisions made on a solid basis.

Of course, one could argue that while the experience with and manufacturing of socket-suspended prostheses is fairly well disseminated around the world, bone-anchored prostheses have been developed and used only in a few centers with sufficient experience. The technique calls for special skills, sufficient staff and resources, and careful attention to detail; as such, it might or might not be generalizable. Future studies of the kinds I've proposed here might help us to determine whether indeed we can recommend wide adoption of this approach or whether our patients would be better served if it is performed in

a few highly specialized, high-volume centers.

Read This Next

- Minor infections and soft tissue irritation in patients with osseointegrated implants impacted the results in this two-center prospective study [1].
- Read this study to compare the experience of patients who received an osseointegrated implant immediately after amputation (in contrast with the different experience of the patients in the study by van Vliet-Blockting and colleagues [24], who received osseointegration secondarily) [3].
- This study shares factors associated with quality of life in patients with a lower limb amputation and helps us understand the complexities associated with evaluating that important endpoint in those patients [7].
- This article discusses risk factors for and the clinical course of soft tissue complications in osseointegrated implants for lower limb amputation from the viewpoint of plastic surgeons [11].

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