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ESSENTIAL SURGICAL TECHNIQUES

SUBSPECIALTY PROCEDURES

Constructing an Osseointegrated Prosthetic Leg

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Published outcomes of this procedure can be found at: *JB JS Open Access*. 2021 Sep 3;6(3): e21.00072, and *J Rehabil Res Dev*. 2009;46(3):331-44.

Investigation performed at the Osseointegration Limb Replacement Center, Hospital for Special Surgery, New York, NY

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Abstract

Background: Constructing an osseointegrated prosthetic leg is the necessary subsequent phase of care for patients following the surgical implantation of an osseointegrated prosthetic limb anchor. The surgeon implants the bone-anchored transcutaneous implant[1,2] and the prosthetist constructs the prosthetic leg, which then attaches to the surgically implanted anchor. An osseointegration surgical procedure is usually considered in patients who are unable to use or are dissatisfied with the use of a socket prosthesis.

Description: This present video article describes the techniques and principles involved in constructing a prosthetic leg for transfemoral and transtibial amputees, as well as postoperative patient care. Preoperatively, as part of a multidisciplinary team approach, the prosthetist should assist in patient evaluation to determine suitability for osseointegration surgery. Postoperatively, when approved by the surgeon, the first step is to perform an implant inspection and to take patient measurements. A temporary loading implant is provided to allow the patient to start loading the limb. When the patient is approved for full-length leg to begin full weight-bearing, the implant and prosthetic quality are evaluated, including torque, implant position, bench alignment, static alignment in the standing position, and initial dynamic alignment. This surgical procedure also requires long-term, continued patient care and prosthetic maintenance.

Alternatives: For patients who are dissatisfied with the use of a socket prosthesis, adjustments can often be made to improve the comfort, fit, and performance of the prosthesis. Non-osseointegration surgical options include bone lengthening and/or soft-tissue contouring.

Rationale: Osseointegration can be provided for amputees who are expressing dissatisfaction with their socket prosthesis, and typically provides superior mobility and quality of life compared with nonoperative and other operative options[3,4]. Specific differences between the appropriate design and construction of osseointegrated prostheses versus socket prostheses include component selection, component fit, patient-prosthesis static and dynamic alignment, tolerances and accommodations, and also the expected long-term changes in patient joint mobility and behavior. Providing an osseointegrated prosthesis according to the principles appropriate for socket prostheses may often leave an

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osseointegrated patient improperly aligned and provoke maladaptive accommodations, hindering performance and potentially putting patients at unnecessary risk for injury.

Expected Outcomes: Review articles describing the clinical outcomes of osseointegration consistently suggest that patients with osseointegrated prostheses have improved prosthesis wear time, mobility, and quality of life compared with patients with socket prostheses. Importantly, studies have shown that osseointegrated prostheses can be utilized in patients with short residual limbs that preclude the use of a socket prosthesis, allowing them to regain or retain function of the joint proximal to the short residuum[5,6]. Osseoperception improves patient confidence during mobility[7]. Because there is an open skin portal, low-grade soft-tissue infection can occur, which is usually treated with a short course of oral antibiotics. Much less often, soft-tissue debridement or implant removal may be needed to treat infection[8]. Periprosthetic fractures can nearly always be treated with familiar fracture fixation techniques and implant retention[9,10].

Important Tips:

- Falls can lead to periprosthetic fractures.
- Malalignment can lead to unnecessary pathologic joint forces, soft-tissue contractures, and an accommodative gait.
- Inadequately sophisticated components can leave patients at a performance deficit.
- Wearing the prosthetic leg while sleeping may lead to rotational forces exerted on the limb, which may cause prolonged tension on the soft tissue.

Acronyms and Abbreviations:

- QTFA = Questionnaire for Persons with a Transfemoral Amputation
- LD-SRS = Limb Deformity Modified Scoliosis Research Society
- PROMIS = Patient-Reported Outcomes Measurement Information System
- EQ-5D = EuroQol 5 Dimensions

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