Latissimus Dorsi Free Flap Salvage of Recurrent Chronic Osteomyelitis with Simultaneous Elbow Interposition Arthroplasty

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Abstract Chronic osteomyelitis is difficult to resolve and usually requires radical debridement, filling of dead space, and a well-vascularized tissue to cover the involved bone. In the tibia, this is frequently accomplished with free vascularized muscle transfer and success rates over 90% for cases of limited involvement but lower success for diffuse involvement. Elbow joints, with advanced arthritis but ineligible for total joint replacement, have been treated with interposition arthroplasty and varying degrees of success limited primarily by instability. A 46-year-old male presented with diffuse osteomyelitis of all three bones at the elbow joint and advanced articular destruction from septic arthritis. He had undergone more than ten previous surgeries without resolution of the osteomyelitis or restoration of elbow function over a 2-year period. Radical debridement followed by a latissimus dorsi free muscle flap interposed to the dead space and layered onto the bones as an interposition membrane was able to solve both of his problems. At 3 years postoperatively, there is no evidence of recurrent osteomyelitis, and the patient declares satisfaction with the daily functional performance of his elbow joint.

Keywords Elbow · Osteomyelitis · Latissimus dorsi free muscle flap

Introduction

Most series of treatment for chronic osteomyelitis concern the tibia [2, 5, 8, 9, 12]. At this location, free muscle flaps have been frequently used as an integral part of the solution. The principles of treatment have been distilled to include three primary concepts: radical debridement of the affected region of the bone, filling of dead space with well-vascularized muscle tissue, complete coverage or contact with the surface of the infected bone for antibiotic delivery [3]. Long-term success rates range from 56% with diffuse osteomyelitis involvement to 91% with limited zones of involvement [2]. More recently, fasciocutaneous flaps have been reported to offer similar degrees of success (no recurrence at 31 months in 14 patients) [12, 13].

Interposition arthroplasty of the elbow as a treatment for posttraumatic arthritis or rheumatoid arthritis has existed for decades in various forms and modifications. Substances interposed between the humerus, ulna, and radius have included J-K membrane, dermal grafts, fascia lata, and muscle [1, 4, 6, 7, 10]. Motion recovery has been fair in most cases, but instability has remained a problem and correlates most closely with patient-reported dissatisfaction [1, 6]. This case concerns a patient that presented an elbow with both complete loss of articular integrity and diffuse osteomyelitis of all three bones resistant to multiple previous surgical debridements and long-term antibiotic treatment.

Case Report

A 46-year-old male sustained a fracture dislocation of his dominant right elbow treated by a hinged external fixator that led to osteomyelitis of the distal humerus, proximal ulna, and proximal radius with complete articular destruction of the

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Figure 1 **a** Patient maintains full active extension of the elbow and **b** 130° of active flexion.

elbow joint. Cultures from early debridements returned methicillin-resistant staphylococcus aureus (MRSA). Despite the continuous administration of antibiotics and thorough debridements every 6–8 weeks for a 2-year period by orthopedic surgeons at an academic medical center, the patient persisted with ongoing purulent drainage from the elbow, high pain levels, and minimal function.

The patient initially presented at this center with a massive abscess actively draining laterally and a request for possible above-elbow amputation. He was initially radically debrided finding all three bones of the elbow to be diffusely permeated with osteomyelitis characterized by a deep green color even to a depth of over 2 cm bony resection. After wide open dressing changes and the institution of intravenous Zyvox, he was returned to the operating room (OR) for a free latissimus dorsi flap that was folded in half to coat the surfaces of the infected humerus and ulna. The flap was also used to eliminate dead space and serve as a soft tissue interposition membrane for elbow arthroplasty. After uneventful microsurgical monitoring in the hospital for 5 days, he began outpatient rehabilitation in a hinged elbow brace that was discontinued 6 weeks later and has not been needed since. The patient has had no clinical evidence of active infection for over 3 years since the flap surgery and has been maintained on oral Bactrim for chronic suppression. He considers the limb very functional with a pain-free active range of elbow motion from 0–130° compared to a very painful preoperative 0–80° (Fig. 1). Grip strength has doubled from 10 to 20 kg. His Disabilities of Arm, Shoulder, and Hand (DASH) score is 19.

Discussion

Free muscle flaps have been a microsurgical standard in the management of osteomyelitis, and in this case, filling dead space was a seminal issue [2, 3, 5, 8, 9, 12]. Unstable elbow joints with extensive articular destruction, not eligible for implant arthroplasty due to prior infection, have occasion-

ally been treated by fascial membrane interposition arthroplasty and hinged external fixation, but with the retention of dead space [1, 4, 6, 10]. Interposition arthroplasty using muscle alone has been successfully reported for isolated destruction of the radiocapitellar and proximal radioulnar joints where the problem with instability is largely eliminated; a series of 14 patients increased Mayo elbow scores from 63 to 89 [7]. Likewise, osteomyelitis limited to the lateral humeral condyle was successfully treated with simultaneous interposition arthroplasty of the radiocapitellar joint using a pedicled lateral arm fasciocutaneous flap in a single case [11]. In this case, the osteomyelitis diffusely involved the humerus, ulna, and radius with extensive penetration, and the elbow joint was completely unstable with loss of all articular integrity. The application of well-vascularized muscle tissue that would normally be used for control of osteomyelitis and to fill dead space as the interposition arthroplasty membrane solved both problems with a unified approach.

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