

# Partial Hand Transplant: Lessons Learned From Cadaveric Dissection Studies

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As the field of vascularized composite allotransplantation continues to expand, new upper extremity transplant candidates are being considered. We recently evaluated a bilateral amputee who had a mid-forearm amputation and a contralateral metacarpal hand amputation. In the latter limb, a “partial” hand transplant that preserved the majority of the patient’s existing hand, including a partially severed thumb with intact thenar muscle function, was proposed. The feasibility of this partial hand transplant was studied in fresh-frozen cadaver limbs. This report details the proposed approach, the cadaveric dissections, and the lessons learned from these dissections. Issues of osteosynthesis, microvascular planning, and intrinsic muscle recovery are discussed, all of which are critical considerations for partial hand transplant candidates. Ultimately, the partial hand approach was felt to be inferior to a more conventional distal forearm transplant in this particular candidate. Practical, functional, and ethical implications of such decision are presented. (*J Hand Surg Am.* 2018; ■(■):■–■. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)

**Key words** Allograft, hand, upper extremity, vascularized composite allotransplantation, VCA.

UPPER EXTREMITY (UE) TRANSPLANTATION remains the most common form of vascularized composite allotransplantation (VCA), with more than 120 transplants in 74 patients reported worldwide.<sup>1</sup> Most often, UE transplants are performed at the level of the forearm, with osteosynthesis of radius and ulna routinely executed in a very efficient and precise manner.<sup>1,2</sup> As the field of VCA continues to expand, new UE transplant candidates

are being considered. Our institution recently evaluated for bilateral UE transplantation a patient who had a right mid-forearm amputation and a left “partial” hand amputation. In the left UE, the second to fifth digits were amputated at the metacarpophalangeal joints and the thumb was severed at the proximal phalanx base (Fig. 1). The patient was able to adduct and oppose the shortened thumb, and strongly desired its preservation. Using fresh-frozen cadaver limbs, we aimed to assess the feasibility of a partial hand transplant in our candidate, focusing on anatomic and functional concerns of a metacarpal-level amputation with a partial thumb. This report describes the findings from these cadaveric dissections, including the obstacles encountered and the important lessons learned.

## CASE REPORT

The candidate was a 42-year-old woman who sustained bilateral UE limb loss due to streptococcal sepsis several years earlier. In the right limb, a standard mid-forearm transplant approach was

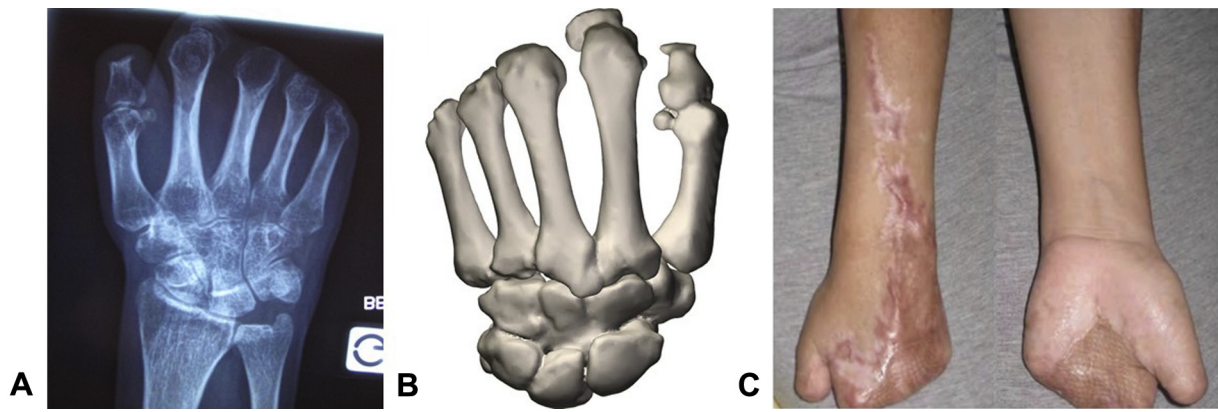
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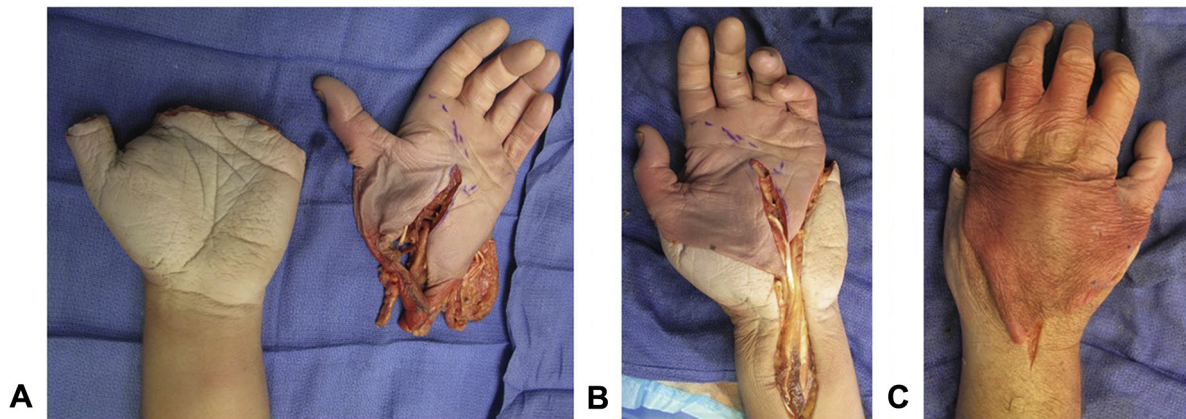
No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

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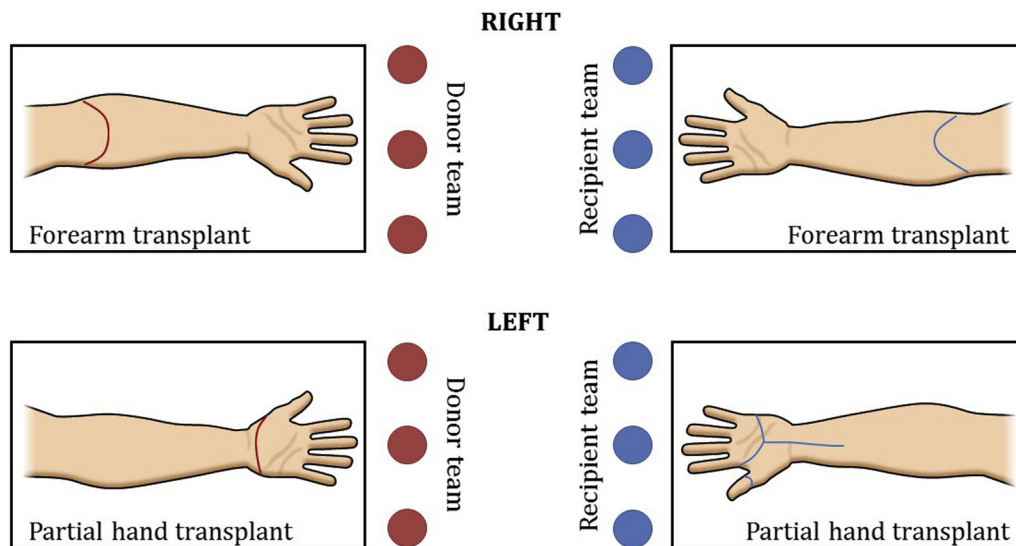
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**FIGURE 1:** Preoperative evaluation of the transplant candidate's left hand. **A** X-rays of the left hand. **B** 3D CAD-CAM reconstruction of the patient's bony framework. **C** Photographs of the patient's left hand.



**FIGURE 2:** Summary of the proposed partial hand transplant approach using a cadaveric left limb. **A** Recipient left cadaveric limb with the donor left partial hand. **B** Volar view of inlay of the donor and recipient hands. **C** Dorsal view of the donor and recipient hand planned coaptation.



**FIGURE 3:** Structure of cadaveric transplant rehearsals. Each rehearsal included 4 cadaveric limbs and 4 respectively assigned teams: (1) right donor, (2) right recipient, (3) left donor, and (4) left recipient. The right limb involved a standard mid-forearm transplant approach. The left limb involved the “partial hand” transplant approach. Each team worked separately at the beginning, with recipient and donor teams then joining together to simulate osteosynthesis, tendon repairs, and neurovascular anastomoses. The left partial hand transplant is the focus of this report.

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