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# Replantation vs revision amputation in single digit zone II amputations<sup>☆</sup>



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Received 16 May 2014; accepted 26 February 2015

## KEYWORDS

Amputation;  
Functional outcome;  
Replantation;  
Single digit;  
Zone 2

**Summary** The objective of this study was to compare the functional outcomes of zone II amputations treated with either replantation or revision amputation at our institution to better aid patients in their decision making process regarding these treatment options.

We conducted a comparative retrospective study. All cases of single digit amputations received at our replantation center between 2007 and 2011 were screened for single digit zone II injuries. These patients were stratified based on the treatment received: replantation vs revision amputation. Patients were called and invited to participate in the research project. Those who accepted to enter the study were asked to complete the Quick-DASH, the Beck Depression Inventory-short form, and a custom made questionnaire.

There were seventeen patients with single digit zone II replantation and fourteen patients with similar injuries who underwent revision amputation and agreed to take part in the study. Our data revealed that the duration of sick leave, occupation after injury, professional and social reintegration, discontinued activities, and self-confidence were not statistically different between the two groups. The average hospital stay and the follow-up period of replanted individuals were longer. The replantation group did not have higher levels of pain or cold intolerance, and the global functional and esthetic satisfaction levels were similar between the two groups. Also, Beck Depression Inventory and Quick-DASH scores were not statistically different. Yet, significantly more patients in the replantation group would opt to repeat the replantation than revised patients would opt for revision amputation.

<sup>☆</sup> The findings of this research project was presented at the 2014 annual meeting of the American Society for Hand Surgery. Grand Hyatt Kauai Resort and Spa | Hawaii, USA | 08–14 Jan 2014.

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From a functional viewpoint, our study suggests that revision amputation is not superior to replantation in zone II single digit amputations. This is valuable information that should be given to patients when deciding on the treatment process and to insure a proper informed consent.  
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## Introduction

Flexor zone II replantation, while often technically feasible and associated with acceptable survival rates, has been associated with less than average functional outcomes.<sup>1</sup> Therefore, single digit amputations located in zone II still present a relative contraindication to replantation because of reported stiffness, insensibility, digital exclusion and an overall functional downgrading of the hand.<sup>2,3</sup> Since revision amputation has classically been considered to be simple, inexpensive and associated with negligible functional impairment, it is viewed as a better alternative to replantation in single digit amputations<sup>4</sup> except for individuals with highly demanding professions such as musicians.<sup>5</sup> However, this view is based on limited scientific evidence, and despite half a century of perfecting replantation, a thorough evaluation of replantation and revision amputation outcomes in flexor zone II has yet to be conducted.<sup>4</sup>

Since 2004, we developed a unique centralized replantation center with a multidisciplinary expertise covering an eight million population over 595,391 square miles. The objective of this study was to compare the functional outcomes of zone II amputations treated with either replantation or revision amputation at our institution. We hypothesize that replantation is superior to revision amputation in zone II single digit amputation.

## Materials & methods

We conducted a comparative retrospective study. All cases of single digit amputations received at our replantation center between 2007 and 2011 were retrieved through the archives after approval from the ethics review board. The inclusion criteria for this study were single digit traumatic amputation or "amputation-like" devascularization located in the flexors zone II treated either by replantation or revision amputation. Given the unproven superiority of either replantation or revision amputation in isolated zone II injuries, treatment plans were established on a case-by-case basis depending on surgeon's assessment of mechanism of trauma, comorbidities and patient's willingness to undergo the lengthy replantation, hospitalization and hand therapy. Randomization was not possible due to ethical considerations.

Flexor Zone II extends from the proximal portion of the flexor tendon sheath A1 pulley to the flexor digitorum superficialis tendon insertion.<sup>6</sup> An amputation was defined as a complete separation of the digit from the hand; whereas, whereas, an "amputation-like" devascularization

involved a vascular, nervous, tendonous and bony lesions to the digit in the absence of separation from the hand. Exclusion criteria included thumb and multiple digit amputations, and amputations outside flexors' zone II. The minimum postoperative follow-up period was 24 months after successful replantation or revision amputation.

All cases of single digit amputations were screened using the inclusion and exclusion criteria listed above. These patients were stratified based on the treatment received: replantation vs revision amputation. Patients were invited to participate in the research project and complete three questionnaires. The Quick-DASH questionnaire<sup>7</sup> was used to evaluate global functional recovery. The Beck depression inventory-short form<sup>8</sup> was used to determine the level of psychological impairment. And the custom-made questionnaire was designed to obtain complementary information. All participants were asked to undergo a follow-up evaluation at our center. Chart review was conducted for gender, age, dominant hand, occupation, smoking, comorbidities, domestic or work accident, worker's compensation, location, date and time of accident, time interval before arrival at the replantation center (i.e. ischemia time), mechanism of injury, digit and hand involved, treatment, hospitalization and follow-up periods. No formal evaluation (e.g. total arc of motion, sensibility testing, etc.) were possible because most of replanted subjects live in distant regions and could not accept our invitation. Statistical analysis was done using the student T and chi-square tests.

## Results

Between 2007 and 2011, 282 finger amputation cases were received at our center of which 149 were replanted and 133 underwent revision amputation. Of these, 38 single digit replantations and 27 single-digit amputation revisions in zone II were identified. Seventeen subjects in the replantation group agreed to take part in the study, five could not be reached because their contact information were inexact, two were not interested in participating and the remaining six did not return the questionnaires. Fourteen patients in the revision amputation group agreed to take part in the study, 16 could not be reached because their contact information were inexact, two were not interested in participating and the remaining three did not return the questionnaires. All revision amputation cases involved simple closures; none of the amputated patients had a ray resections procedure.

There was no statistical difference between the replantation and revision amputation groups with regard to patients' characteristics; namely, the finger involved

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