

## The outcomes of severed finger replantation at Military Central Hospital 108

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### ABSTRACT

**Objective:** Finger amputation is a severe yet non-life-threatening injury that significantly impacts patients' functional abilities, daily activities, and aesthetics. Microsurgical techniques have enabled successful finger replantation, restoring function and improving quality of life. This study evaluates the outcomes of long finger replantation at 108 Military Central Hospital, analyzing factors influencing surgical success and long-term functional recovery. **Methods:** A retrospective cross-sectional descriptive study was conducted on patients who underwent finger replantation between 2015 and 2019. **Results:** The most affected age groups were young adults and middle-aged adults, comprising 87.1% (27/31) of the cases. The most common cause was saws, accounting for 35.5% (11 cases), followed by forming machines at 19.4% (6 cases). Knives and paper cutters each contributed 16.1% of cases (5 patients each), while winding machines caused 9.7% (3 cases), and cloth cutters were responsible for 3.2% (1 case). The results indicate a high survival rate (91.4%) and functional recovery, with 35.4% of fingers achieving Grade IV function. **Conclusion:** These findings highlight the effectiveness of microsurgical replantation in restoring hand function and underscore the importance of postoperative rehabilitation.

**Keywords:** *Finger amputation, functional recovery, microsurgery, replantation*

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### INTRODUCTION

Finger amputation is among the most severe hand injuries encountered in orthopedic and trauma surgery. Although not life-threatening, it significantly impairs a patient's ability to perform daily tasks, affects occupational productivity, and leads to psychological distress. Over the past decades, advances in microsurgical techniques have made replantation a viable option, offering functional and aesthetic restoration [1-3].

Vietnam has made remarkable progress in microsurgery, with 108 Military Central Hospital being a leading institution in finger

and hand replantation. Early reports of successful replantations encouraged wider adoption of these techniques nationwide. Despite high success rates, various factors such as injury characteristics, surgical expertise, and postoperative rehabilitation influence the outcomes.

This study aimed to evaluate the success of long finger replantation at 108 Military Central Hospital, focusing on short-term survival rates and long-term functional recovery. By identifying key factors affecting outcomes, we hope to provide insights that will improve surgical strategies and patient care.

## METHOD

A retrospective cross-sectional descriptive study design was employed to evaluate the outcomes of finger replantation. This study included all patients who had complete amputation of long fingers and met the indications for replantation. Only those with comprehensive medical records, including administrative details, clinical symptoms, paraclinical findings, surgical procedures, postoperative status, and

discharge condition, were eligible for inclusion. Patients who had amputated long fingers but did not undergo microsurgical replantation, as well as those with incomplete medical records or missing research criteria, were excluded from the study.

The research focused on demographic characteristics such as age, gender, and cause of injury, along with injury characteristics, specifically the location of the amputation.

## RESULTS

### Patient characteristics

The male-to-female ratio was 4:1.

The age distribution is presented in Table 3.1.

*Table 1. Age group distribution (n = 31)*

Age Group	Number of Patients	Percentage (%)
≤ 16 (Children)	4	12.6%
16-25 (Young Adults)	7	22.6%
25-60 (Middle-Aged Adults)	20	64.5%
≥ 60 (Elderly)	0	0%
Total	31	100%

The most affected age groups were young adults and middle-aged adults, comprising 87.1% (27/31) of the cases.

### Clinical features

Among the 31 patients classified by the cause of injury, the most common cause was saws, accounting for 35.5% (11 cases), followed by forming machines at 19.4% (6 cases). Knives and paper cutters each contributed to 16.1% of cases (5 patients each), while winding machines caused 9.7% (3 cases), and cloth cutters were responsible for 3.2% (1 case).

Regarding injury characteristics, a total of 70 long fingers were affected. Among them, 59 fingers (84.3%) were completely severed, while 11 fingers (15.7%) were incompletely severed. In terms of bone injury sites, the proximal phalanges were the most frequently affected, accounting for 70% (49 out of 70 fingers). MCP joints were the second most common injury site, observed in 20% (14 cases). Other injury sites included the middle phalanges (4.3%, 3 cases), PIP joints (2.9%, 2 cases), DIP joints (1.4%, 1 case), and distal phalanges (1.4%, 1 case).

### Short-term outcomes

Among the 70 replanted long fingers, 64 survived, achieving a high success rate of 91.4%. Meanwhile, 1 finger (1.4%) was partially necrotic, and 5 fingers (7.2%) were completely necrotic.

When analyzing short-term outcomes based on injury characteristics, the survival rate of completely severed fingers was 89.8% (53 out of 59), whereas all 11 incompletely severed fingers (100%) remained viable without any cases of necrosis.

### **Long-term outcomes**

In the long-term assessment of range of motion (ROM) compared to the opposite side, 19 out of 65 fingers achieved more than 30% of the ROM. Specifically, the second finger had the highest proportion of cases with over 60% ROM (4 cases), followed by the third finger (1 case). The majority of cases (23 out of 65) had less than 30% ROM.

### **Motor function and sensory recovery**

Regarding motor function recovery, the highest proportion of fingers reached M5 grade, accounting for 34.5% (25 out of 65). M4 recovery was observed in 29.2% (19 cases), while M3 recovery was achieved in 32.3% (21 cases). No cases were classified as M0, M1, or M2.

Sensory recovery outcomes indicated that the most common recovery level was S3+, observed in 27.7% (18 out of 65) of cases. This was followed by S3 (26.2%) and S4 (24.7%). Lower levels of recovery, such as S1 and S1+, were observed in only 4.6% of cases each, while no cases were classified as S0.

## **DISCUSSION**

According to our study, the average age of patients was 30.2 years, ranging from 4 to 58 years. The majority (87.1%, 27/31) were young and middle-aged individuals, who represent the main workforce in society, where occupational safety is often not well ensured. These findings align with previous studies, such as that of Hattori et al., which reported that 88% (44/50) of replanted long fingers belonged to working-age individuals [1]. Males accounted for the majority of cases (77.4%, 24/31), a proportion slightly lower than in studies by Hattori et al. (85.7%) and Oruc et al. (88.3%) [4]. This could be attributed to the increasing participation of women in physically demanding jobs in recent years.

Regarding clinical features, saw and cutting machine injuries were the most common causes, accounting for 35.5% of cases, highlighting the need for improved occupational safety measures. Completely severed fingers were predominant, comprising 84.3% of cases. This is consistent with O'Brien's study, which found that 56%

of replanted long fingers were completely severed. Occupational and domestic accidents contribute significantly to the high rate of complete amputations [5].

In terms of surgical outcomes, the success rate of replantation was higher in the partially severed group (100%) than in the completely severed group (89.8%). Complete amputations often involve extensive damage to all structures, making surgery more challenging and reducing success rates. The success rate also varied based on injury patterns, with clean-cut amputations achieving a higher survival rate (95.5%) compared to crushed and avulsed injuries (89.6%). Hattori et al. reported a 100% success rate for clean-cut injuries but only 72.7% for crushed and avulsed injuries. These findings suggest that crushed and avulsed injuries require more extensive surgical expertise, particularly in assessing and debriding damaged tissue, which affects replantation outcomes.

Most injuries occurred at the proximal phalanx and metacarpophalangeal (MCP) joint, accounting for 90% (63/70). Anatomically, blood vessels increase in

diameter from the periphery toward the center, which supports a higher survival rate in these regions. However, vascular factors alone do not determine success, as the complexity of anatomical structures, the need for multiple reconnections, prolonged surgical time, and ischemia all impact survival rates.

Long-term outcomes among the 65 surviving fingers showed that 9.2% were classified as Grade I, 26.2% as Grade II, 29.2% as Grade III, and 35.4% as Grade IV, similar to findings by Kwon et al [6], who reported comparable proportions in a long-term follow-up study. A notable case involved a 12-year-old child with a transverse amputation at the proximal phalanx of the index finger due to a rolling machine injury. Following replantation, the finger survived, achieving M5 muscle strength and S4 sensory recovery. The child was able to write and perform daily tasks effectively, reinforcing that replantation in pediatric patients generally yields favorable outcomes, as also reported by Cheng et al. [7] and Ikeda et al. [8].

When analyzing injury types, clean-cut and crushed injuries had similar proportions of Grade I outcomes, whereas no avulsion injuries achieved this classification. Proper debridement and replantation of clean-cut and crushed injuries typically lead to better outcomes, allowing for early rehabilitation and improved long-term function.

Sensory recovery was another key aspect of our study, with 52 out of 65 fingers regaining sensation at S3-S4 levels. Glickman et al. reported that 54% of 367 fingers achieved S3+ or S4 recovery. These findings highlight the importance of microsurgical techniques in optimizing sensory recovery in replanted fingers [9].

## CONCLUSIONS

These findings highlight the effectiveness of microsurgical replantation in restoring hand function and underscore the importance of postoperative rehabilitation.

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