Survival after digit replantation and revascularization is not affected by the use of interpositional grafts during arterial repair

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BACKGROUND

Primary arterial repair in digit revascularization and replantation is complicated by a large zone of injury. After traumatized vessel is debrided and primary anastomosis is not possible, interpositional grafts can be utilized to reconstruct the artery. The rates of digit survival after revascularization and replantation in primary anastomosis compared to anastomosis with the use of an interpositional graft are not well elucidated. The purpose of this study is to determine the effect of using interpositional graft on rates of digit survival.

METHODS

- A retrospective review of all patients from 2007 to 2016 that required revascularization and/or replantation of one or more digits was performed.
- Demographic data, mechanism of injury, level of injury, and digits requiring revascularization or replantation were collected.
- In addition, use of interpositional graft for artery (Y/N), length of interpositional graft used, and graft donor site were collected.
- Survival of the digits was the primary outcome measure.

RESULTS

- 127 patients were identified with 171 affected digits. 119 patients (94.4%) were male.
- There were a total of 118 digits that underwent revascularization and 53 digits that underwent replantation.
- Of the 118 revascularizations, a graft was used to repair the artery in 50% (n=59) of digits.
- Digit survival with use of a interpositional graft for arterial repair vs. primary repair after revascularization was equal (91.5% in both groups).
- Of the 53 replantations, a graft was used to repair the artery in 49.0% (n=26) of the digits.
- There was no statistical difference in digit survival with primary repair vs. use of a graft for arterial repair vs. after replantation (48.1% vs. 46.2%, p = 0.88).
- The most common source of graft was a vein from the forearm & wrist (48.2%, n = 41) followed by vein harvested from the dorsal foot (47.1%, n = 40).
- The site of graft did not have any effect on digit survival (p=0.97).
- Interpositional grafts was more likely to be used in crush (62.5%) and avulsion injuries (72.2%) compared to sharp laceration injuries (11.1 %) with relative risk of 5.6 (p=0.01) and 6.5 (p=0.006) respectively.

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TABLE 1. Demographics

Characteristic	Value (%)
No. of patients	127
No. of digits	171
Sex	
Male	120 (94.5%)
Female	7 (5.5%
Age, yrs	
Mean ± SD	38.0 ± 15.7
Range	1-80
Side	
Right	48 (37.8%)
Left	79 (62.2%)
Average length of stay, days	
Mean	9.2
Range	2-26
Mechanism of injury	
Blunt-cut	111 (64.9%)
Crush	24 (14.1%)
Avulsion	18 (10.5%)
Clean-cut (guillotine)	18 (10.5%)
Type of reconstruction	
Revascularization	118 (69.0%)
Replantation	53 (31.0%)
Use of interpositional graft by type of reconstruction	
Revascularization	59 (50.0%)
Replantation	26 (49.0%)
Source of interpositional graft	
Forearm & wrist vein	41 (48.2%)
Dorsal foot vein	40 (47.1%)
Artery from spare part	4 (4.7%)

TABLE 2. Digit survival rates by source of graft

Source of graft	Digits survived (%)	p-value
Forearm & wrist	31 (75.6%)	
Dorsal foot	32 (80.0%)	
Spare part	5 (8.5%)	0.97

TABLE 3. Comparison of outcomes between primary arterial repair vs. interpositional grafting

	Number (%) of patients	p-value
Revascularizations		
Digit survival		
Primary repair	54 (91.5%)	1.00
Interpositional graft	54 (91.5%)	
Unplanned return to OR		
Primary repair	7 (11.9%)	0.14
Interpositional graft	13 (22.0%)	
Replantations		
Digit survival		
Primary repair	13 (48.1%)	0.88
Interpositional graft	12 (46.2%)	
Unplanned return to OR		
Primary repair	6 (22.2%)	0.32
Interpositional graft	9 (34.6%)	

TABLE 4. Use of interpositional graft by mechanism of injury

Mechanism	No. (%) utilizing interpositional graft	Risk ratio (95% CI)	p-value
Sharp laceration	2 (11.1%)	---	
Blunt laceration	55 (49.5%)	4.5 (1.19 – 16.70)	**0.03***
Crush	15 (62.5%)	5.6 (1.47 – 21.54)	**0.01****
Avulsion	13 (72.2%)	6.5 (1.71 – 24.77)	**0.006****

CONCLUSION

- Interpositional grafts were utilized in nearly half of all arterial repairs.
- There was no statistical difference in the survival rate of amputated or devascularized digits that required interpositional grafting for repair versus those that were repaired primarily.
- The need for an interpositional graft in a large zone of injury should not be considered a contraindication to performing revascularization or replantation.
- Furthermore, hand surgeons should have a low threshold for using interpositional grafts especially in crush or avulsion injuries.