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Long-term Follow-up Results of 97 Finger Replantations

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Summary. From a total number of 664 finger replantations (D II-D V) we were able to carry out a follow-up of 97 postoperative cases using the follo-wing assessment criteria: mobility, sensitivity, type of amputation, mechanism of injury, level and extent of amputation. Subjective criteria were also taken into account. Using the results of the study we have been able to formulate an evaluation as to the absolute indication for operation of fingers D II-D V.

Zusammenfassung. Von 664 Langfingern konnten bei 97 Spätergebnisse nach Replantationen überprüft werden: die Bewertungskriterien waren Beweglichkeit, Sensibilität, Amputationsart, Verletzungsmechanismus und Amputationshöhe. Subjektive Kriterien wurden berücksichtigt. Anhand dieser Ergebnisse wurden Kriterien erarbeitet zur Beurteilung einer absoluten Indikation zur Replantation von Langfingern.

From November 1975 until March 1980, a total of 839 hand replantations on 486 patients were performed by the replantation specialists of the Dept. of Plastic Surgery at "Klinikum Rechts der Isar", the medical facility of the Technical University of Munich.

A total of 668 of the amputates (79.6%) were incorporated. While the incorporation rate was 84.5% for the 387 complete traumatic amputations, it was only 75.4% (452 cases) for the subtotal traumatic amputations (Table 1). The 387 total traumatic amputations included 87 pollices, 289 fingers, four complete hands, and eight metacarpals. The 452 subtotal amputations comprised pollices, 289 fingers, and eight metacarpals.

The postoperative results of the pollex replantations has already been presented (Stock et al. 1979). In this report functional and subjective long-term results will be presented to draw conclusions as to the indications for this type of surgery. Of the 664 finger replantations, a follow-up examination of 64 patients (with a total of 97 single or multiple-finger amputations) was possible. An interpretation of the results of these examinations can be found in Table 3.

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Table 1. Replantation of the hand (Nov. 1. 1975-March 31, 1980)

Patients	$N=486$		
Re-plantations	$N=839$	Success rate	$N=668$ (79.6%)
Total amputations	$N=387$	Success rate	$N=327$ (84.5%)
Subtotal amputations	$N=452$	Success rate	$N=341$ (75.4%)

Table 2

	Total amputations	Subtotal amputations
Pollices	87	64
Fingers	289	375
Metacarpals	7	8
Hands	4	5
	$N=387$	$N=452$

Table 3. Follow-up examinations of 64 patients with a total of 97 traumatic amputations of the finger

Right		Left		Total	
D II	22	D II	28	D II	50
D III	13	D III	13	D III	26
D IV	13	D IV	8	D IV	13
D V	2	D V	6	D V	8
	42		55		97

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Table 4. Postoperative assessment of finger mobility as per Buck-Gramcko

Assessment of the fingers		Points
FKHA/Total flexion	0 –2.5 cm/≧200°	6
	2.5–4 cm/≧180°	4
	4 –6 cm/≧150°	2
	>6 cm/<150°	0
Flexor deficit	0°– 30°	3
	31°– 50°	2
	51°– 70°	1
	> 70°	0
Range of motion	≧160°	6
	≧140°	4
	≧120°	2
	<120°	0
Assessment: very good		14–15
good		11–13
satisfactory		7–10
poor		0– 6

Table 5. Postoperative assessment of sensitivity as per Highest (1943) (modified version)

S 0	Lack of sensation
S 1	Proprioceptive sensation
S 2	Superficial sensation of pain sense of touch
S 3	2 - point discrimination
S 4	2 - point discrimination of less than 12 mm

Assessment Criteria

Due to significant variance in initial conditions, such as additional injury, previous injury, or missing amputate, a completely accurate interpretation of the follow-up examinations is difficult.

For the sake of clarity, we have restricted ourselves, as we did in the evaluation of pollex replantation, to assessment using well-known and generally accepted criteria.

1. Mobility of the replanted finger was measured according to a scheme proposed by Buck-Gramcko et al. (1976) (Table 4).
2. The degree of sensitivity was classified using a modified version of the model introduced by Highet (1943) (Table 5).
3. As subjective assessment criteria, the patient's sensitivity to cold was determined. The patient was then asked whether or not, if allowed to choose again, he would refuse replantation.

Table 6. Type of amputation

Mobility	Total	Subtotal	
Very good	4= 8.3%	8=16.3%	12=12.4%
Good	14=29.2%	5=10.2%	19=19.6%
Satisfactory	10=20.8%	8=16.3%	18=18.5%
Poor	20=41.7%	28=57.2%	48=49.5%
	N=48=100%	N=49=100%	N=97=100%

Table 7

Zone	Mobility		
Metacarpo-phalangeal joint	Very good	0	0
	Good	1	9
	Satisfactory	3	27
	Poor	7	64
		N=11	100
Proximal phalanx	Very good	8	16
	Good	7	14
	Satisfactory	10	20
	Poor	26	51
		N=51	100
Proximal inter-phalangal joint	Very good	1	4
	Good	7	27
	Satisfactory	4	15
	Poor	14	54
		N=26	100
Medial phalanx distal interphalongeal joint endphalanx	Very good	3	33
	Good	4	44
	Satisfactory	1	11
	Poor	1	11
		N=9	100

Results

The mobility of the replantanted fingers was poor in less than 50%, satisfactory in 18%, good in 20%, and very good in 12% of the cases.

In Tables 6, 7, and 8, respectively, the postsurgical mobility is evaluated individually according to type of injury, level and extent of amputation.

The post-replantation mobility attained is not as good in cases of amputation at the interphalangeal or metacarpophalangeal joints as it is following amputation in the vicinity of the shaft. Also, mobility achieved after a distal amputation is much better than that achieved after a proximal amputation.

Table 8

Type of injury	Mobility	
Incised wounds, including buzz-saw injuries	Very good	9 = 12.3%
	Good	14 = 19.2%
	Satisfactory	9 = 12.3%
	Poor	41 = 56.2%
		$N = 73 = 100\%$
Crush injury	Very good	3 = 25%
	Good	3 = 25%
	Satisfactory	5 = 41.7%
	Poor	1 = 8.3%
		$N = 12 = 100\%$
Combined traumatic amputation and avulsion of the finger	Very good	
	Good	1 = 8.3%
	Satisfactory	5 = 41.7%
	Poor	6 = 50%
		$N = 12 = 100\%$

Table 9

Type of injury	Sensitivity	
Incised wounds, including buzz-saw injuries	S 4	38 = 52%
	S 3	5 = 6.8%
	S 2	13 = 17.8%
	S 1	12 = 16.4%
	S 0	5 = 6.8%
		$N = 73 = 100\%$
Crush injuries	S 4	7 = 58.3%
	S 3	1 = 8.3%
	S 2	2 = 16.7%
	S 1	1 = 8.3%
	S 0	1 = 8.3%
		$N = 12 = 100\%$
Combined traumatic amputation and avulsion of the finger	S 4	8 = 66.7%
	S 3	1 = 8.3%
	S 2	1 = 8.3%
	S 1	2 = 16.7%
	S 0	
		$N = 12 = 100\%$

Sensitivity

With respect to the modified scheme proposed by Highet (1943) in seven of the replanted fingers no sensation was detectable, in 15 only proprioceptive sensation was present, in 16 a minimal, superficial sensation of pain as well as a sense of touch could be detected; in seven cases discrimination of points greater than 12 mm apart was possible and in 53 patients there was a 2-point discriminations of less than 12 mm (Table 5). No unequivocal correlation between degree of sensitivity obtained and type of injury could be found.

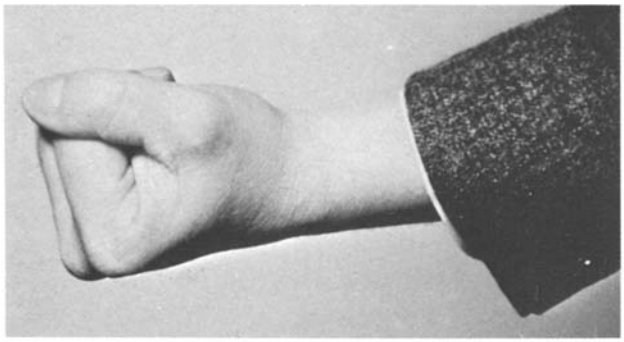
Fig. 1. P. J., 58-year-old patient with a complete amputation (injury with a wire cable) of D III, D IV, and D V

Subjective Assessment

The patient's subjective assessment should never be disregarded. Remarkably, all of the patients examined complained of an unpleasant sensation of coldness that was not appreciably relieved by wearing gloves. It took 2 to 3 years for this unpleasent hypersensitivity to diminish significantly. Of the 64 patients, 59 were extremely satisfied with the results of their replantations. All were able to maintain their previous jobs. Five of the patients, however, if allowed to choose again, would have rejected the procedure.

Discussion

The results of our finger replantations are varied. By taking expected functional results into account we have, nevertheless, developed guidelines to be used in determining when replantation is indicated. According to these guidelines, an absolute indication for surgery is presented following: (1) Traumatic amputation of the index finger with missing middle finger, (2) traumatic amputation of the middle finger with missing index-finger, (3) traumatic amputation of any finger of a child, and (4) multiple traumatic amputation.



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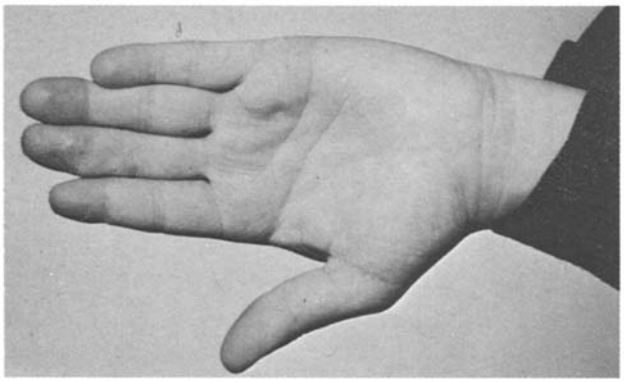

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Figs. 2 and 3. Functional results after 1 year

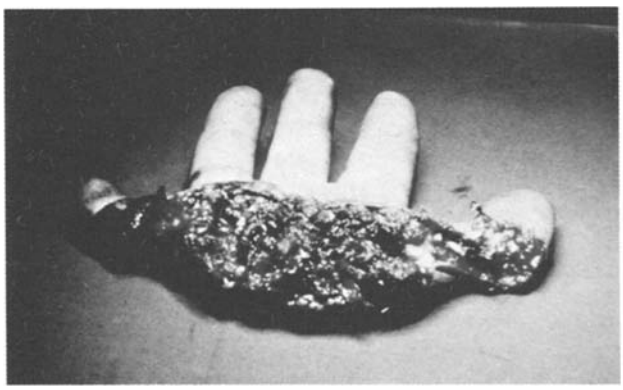
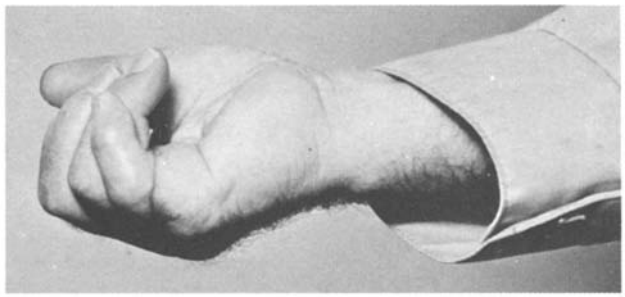


Fig. 4. D. J., 56-year-old patient with a complete, five-finger amputation (buzz-saw accident)

In a patient who has severed four fingers and whose daily job requires a strong grip, we have found the replantation of at least the middle and the little finger to be functionally advantageous because, with these two fingers, coarse grasping is best accomplished. In the previously described case, a finger transfer, if at all possible, is indicated.

A statement of absolute indications for replantation should, by no means, result in the rejection of a possible replantation candidate per telephone. Even after considerable destruction of the amputate, following, e.g., crush injuries or explosions replantation of essential body components is possible using microsurgical techniques.



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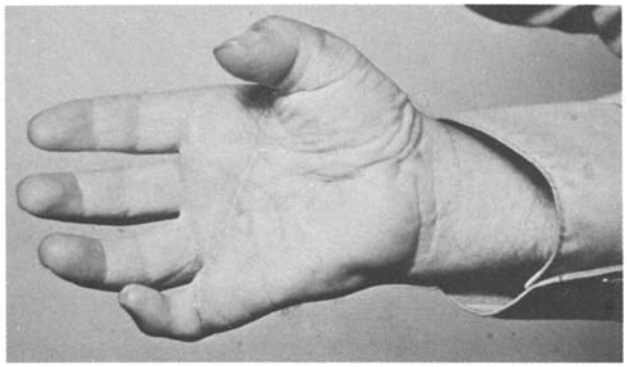

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Figs. 5 and 6. Functional results 8 months after the injury

According to our experience, indication for replantation is not dependent on the type of injury or age of the patient. Our youngest patient was 16 months old and the oldest 76 years of age. Even if the criteria for replantation are not fulfilled, the patient's wishes as well as his professional needs must be taken into account. A conversation between experienced transplant surgeon and patient should always preclude the final decision as to whether replantation is indicated.

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