ORIGINAL ARTICLE

Our Experience with Revascularization and Replantation of Hand

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ABSTRACT

Background: Hand is the main functional unit of body. An amputation is a sum of vascular injury, an open fracture, a soft tissue injury and a nerve injury. Reattachments of amputated parts can result in severe morbidity both during and after surgery. Replantation of a limb continues to be technically demanding procedure. We share our experience of revascularization and replantation of complete and partially amputated hands.

Material and Methods: Two year retrospective study, which include patients with complete or incomplete amputation of hand. All patients underwent either revascularization or replantation surgery. Patient's demographics, mode of injury, level of injury, ischemia time and survival were studied. Outcome was assessed on the bases of patients' satisfaction.

Results: We studied 16 cases, with amputation of hand. 5 patients had crush injury while 11 faced sharp injury.4 replantation and 12 revascularization surgeries were performed. The rate of survival was 62.5 %. Successful revascularizations were 66.6 % (8 of 12 patients) and replantations were 75% (3 of 4 patients). All the patients were satisfied with their results

Conclusion: The majority of the included patients exhibited good or very good function of the extremity, none of the replanted appendages regained normal levels of functionality. All participants were very satisfied with their outcomes

Introduction

Hand is the most important part of human body. Hand is a complex combination of different types of bones and joints. Loss of hand or part of it not only effect a man's working ability but it also has an impact on a person's psychology. Traumatic hand amputation is the most catastrophic event in young working individuals[5].Depression occurs in about ≥30% of amputees [4,8]. Psychological morbidity, decreased self-esteem, and social isolation are also observed in short and long-term follow up after amputation[9,10].

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Replantation surgery is now a standard approach to upper limb amputation around the world [2.] The Quality of life of the patient is preserved by revascularization and replantation of traumatic hand injury[5.]The survival rate of replanted digits is 80 to 90 % in literature[6-7].

Materials and Methods

This was a retrospective study conducted at department of plastic surgery at a tertiary care hospital in Karachi .After institutional review board approval, patients with hand amputation who underwent revascularization or replantation from July 2017 to June 2019 were included in the study. All these patients have either complete or incomplete amputation of any part of hand distal to the wrist level. Amputations above wrist joint

and patients who had been operated in any other hospital and arrived for revision surgery were excluded from our study.

We reviewed our data base for revascularization and replantation and assessed it for demographic profile, mode of injury, level of injury, ischemia time, survival and follow up. Outcome was assessed on the bases of patients' satisfaction. Figure 1 shows demography, level of amputation ischemia time and procedure performed

Procedure

All the patients were assessed in emergency department and were planned. In operating room, the amputee and stump were assessed and damaged tissue was carefully removed. Bone ends were shortened and rejoined with k wires to hold the bones in place and to allow the rest of the tissues to be restored without tension. Anastomosis of vessels and coaptation of nerves were done. Muscles and tendons were then repaired. In some patients grafts of skin, tendons and blood vessels were needed, too.

All patients had post operative splintage for 4-6 weeks followed by physiotherapy.

Figure1: Amputation of thumb & Replantation done

Sr. No.	Age	Gender	Mechanism of injury	Level of amputation	Ischemia time at arrival	Procedure
1	27	Male	Crush	Thumb Proximal phalynx	5 hrs	RV
2	31	Male	Crush	CMJ	2 hrs	RP
3	25	Female	Sharp	Proximal phalylx middle finger	3.5 hrs	RV
4	24	Male	Crush	Mid plalynx index	4 hrs	RV
5	35	Male	Crush	Wrist joint	5 hrs	RV
6	38	Male	Sharp	MPJ	3 hrs	RP
7	29	Male	Sharp	Distal phalynx	2 hrs	RV
8	33	Male	Crush	Metacarpal	1.5 hrs	RP
9	28	Male	Crush	Thumb IPJ	6 hrs	RP
10	40	Male	Sharp	Base of metacarpals	4 hrs	RV
11	48	Male	Crush	Wrist joint	5 hrs	RV
12	18	Male	Crush	Index and middle finger	6 hrs	RV
13	22	Female	Sharp	Rt index middle phalnx	2.5 hrs	RV
14	34	Male	Crush	CMCJ	8 hrs	RV
15	36	Male	Crush	Head of metacarpal	4 hrs	RV
16	38	Male	Crush	CMCJ	5 hrs	RV

Table 1:- Details of injuries to the patients

Figure 2: Amputation at wrist & Replantation (Late follow up)

Results

We treated 16 patients of hand amputation in two years. Male to female ratio was 7:1.Mean age group was 31.6 years (range 18 to 48 years).Out of 16 patients, our 5 patients (31.3%) had sharp injury and 11 patients (68.7%) had crush injury. 12 patients had revascularization while 4 had replantation surgery

Outcome

The rate of survival after revascularization of amputated limb was 66.6 % (8 of 12 patients) and after replantation was 75% (3 of 4 patients). Average of 62.5 %. The outcome of successful hand replantation and revascularization was assessed by subjective patients' satisfaction. Three month follow up shows that 7 patients had good functional outcome and 3 patients had excellent outcome. However 1 patient was lost to follow up.

	Procedure	**Ischemia time**	**Survival (48 hours)**	**Outcome 3 months**
1	Thumb revascularization	7 hrs	Viable	Good
2	Hand replantation	4.5 hrs	Viable	Excellent
3	Finger revascularization	5 hrs	Viable	Excellent
4	Revascularization	6.5 hrs	Viable	Good
5	Revascularization	7.5 hrs	Non viable	——
6	Thumb replantation	6 hrs	Viable	Good
7	Digit revascularization	3.5 hrs	Viable	Excellent
8	Hand replantation	7 hrs	Viable	Good
9	Replantation	8 hrs	Non viable	——
10	Digit revascularization	7 hrs	Non viable	——
11	Wrist revascularization	7 hrs	Viable	Good
12	Finger revascularization	8 hrs	Non viable	Good
13	Fingers revascularization	6 hrs	Viable	Good
14	Hand revascularization	10 hrs	Viable	Good
15	Hand revascularization	7 hrs	Non viable	Good
16	Hand revascularization	8 hrs	Viable	Good

Table 2:- Details of Procedures undertaken

Discussion

In 1962, the first successful limb replantation was performed on a 12 year old boy after traumatic amputation[2], it was reported by Ronald Malt in 1964[3].With the passage of time and advances in microvascular surgery, salvage of amputated limb has become a common practice in many centersaround the world..Razana et al.described an overall success rate of 65.6%[11] in 1998. Now the success rate has reached uto 80 _90 %[1]. Our success rate of replantation was 75%,that is at par with other tertiary care unit.

Following the high survival rate of replanted and revascularized post-traumatic hand amputation, recent emphasis has now shifted to functional recovery of the restored part rather than mere survival only. Although the functional outcome of replanted hands will never equal to that of the normal healthy counterpart, the aim of surgery is to produce major functional, cosmetic and psychological improvements in these patients.

In this study, analysis of patient demographic factors (age, sex) and factors related to amputation (level and type of injury) showed no significant influence in the overall survival rate. However, significantly better survival rates were observed in patients who were operated within 6 h compared to those who were operated after 6 h.

Conclusion

Mode and level of injury and ischemia time are important predictors of success rate of revascularization and replantation of upper limb.Multiple-level, diffuse crush, or avulsion injuries, even if the injuries were incomplete had less return of function.

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