

ABSTRACT

The fingertip amputation is a common hand injury. However, Replantation of fingertip is not possible if the vessels of the stump was crushed by injury. The aim of the study is to evaluate functional and aesthetic outcome of “Hybrid Abdominal Flap” which is composed of random-pattern abdominal skin flap and autologous bone graft.

An autologous bony stump was harvested if it was intact and If not, autologous bone graft was harvested from olecranon. After the bony fixation, the abdominal flap was utilized for soft tissue coverage. Division of pedicle had undergone three weeks after surgery and the debulking procedure was carried out. Functional and aesthetic outcome was assessed three months after debulking procedure.

A total of six patients had undergone Hybrid Abdominal flap. All the flaps survived without complications such as nonunion and flap necrosis. Patients were satisfied with the appearance and the function of their finger including range of motion and sensory.

Despite immobilization of the arm for three weeks can be considered as disadvantages, our novel Hybrid Abdominal Flap is functionally and aesthetically considerable option for fingertip amputations with crushed stump.

INTRODUCTION

The amputation at the level of distal phalanx is a common hand injury, accounting for about 1% of all trauma-related injuries. It is normally treated with revision amputations, local flaps, and skin grafts. The basic goal of the treatment is recovering the function and nature contour of the finger. Despite its advantages of local flaps and amputations for quicker return to work while maintain functions, shortening of finger after injury is aesthetically frustrating to patients. Replantation of fingertip amputation is also very difficult according to its level of the injury, even if the stump is clean-cut.

Random-pattern abdominal flap which was first described by Biggs in 1898. could be a reliable and time-saving option with bone graft to preserve finger’s length and overall contour.⁴ Successful sensory recovery after abdominal flap coverage over fingertip amputation has been previously proven.

The aim of the study was to evaluate functional and aesthetic outcome of random-pattern abdominal skin flap combined with bone graft, named as hybrid abdominal flap.

RESULTS

All the flaps survived and the follow-up duration was from 3 weeks to 6 months. The mean age was 39.2 years, ranging from 25 to 53 years. 3 were females, and 3 were males. All the patients were satisfied with the appearance of their finger. The mean operative time was 43 mins without sacrifice to major vessels. In 2 patients, the bone graft was harvested from the distal stump when a bone from the stump was intact. In 4 patients, the olecranon bone graft was performed when no available bone was found from the stump (Table 2).

In MHQ score, overall hand function including daily activities and work performances at the third postoperative month was better than the initial. More than the half of the patient (n=4) scored better in the pain, appearance and the general satisfaction section than the initial (Table 3). For the sensory recovery, the pain and tactile feeling were noted in most of the patients (n=5), but the cold sensation was checked only in one patient during the follow-up period (Table 4).

No complications such as nonunion, infection and flap loss were reported. Venous congestion was observed in 2 patients after flap division, the congestion was controlled with either NPWT or heparin injection (Figure 2). The congestion was relieved three days after the NPWT application.

Patient	Sex/Age	BMI	Medical history	Amputation level	Stump condition	Bone graft	Operative Time	Follow-up	Complication
1	M/25	25.3	-	Rt. 3 rd finger, IB	Ischemic	Stump	75 mins	6 mo	-
2	F/50	20.8	-	Rt. 4 th finger, IB	Crushed	Olecranon	50 mins	3 mo	-
3	F/34	20.8	-	Rt. 2 nd finger, IA	Clean	Stump	40 mins	4 mo	Venous congestion
4	M/34	26.7	-	Rt. 2 nd finger, IA	Ischemic	Olecranon	55 mins	5 mo	-
5	F/53	28.2	-	Rt. 3 rd finger, IA	Crushed	Olecranon	35 mins	4 mo	-
6	F/39	26.1	-	Rt. 3 rd finger, IA	Ischemic	Olecranon	51 mins	5 mo	

CONCLUSIONS

Replantation should be first considered for the fingertip amputation. However, Hybrid abdominal flap is a safe, convenient, and reliable option when stump is crushed and necrotized. It requires less operative time, and not sacrifice the major vessels. Although the long hospital stay, multiple operations, and immobilization of the arm are considered as disadvantages, abdominal flap with bone graft could be the best option for maintaining length and function of hand in fingertip amputations.

PATIENTS & METHODS

The retrospective review was performed on immediate fingertip reconstruction using Hybrid abdominal flap which combines random-pattern abdominal flap with autologous bone graft from March 2019 to January 2021. Proper informed consent was attained, and each patient was provided with an explanation of the procedure. All procedures were performed in a standard manner by the senior plastic surgeon at single institution (JH Park).

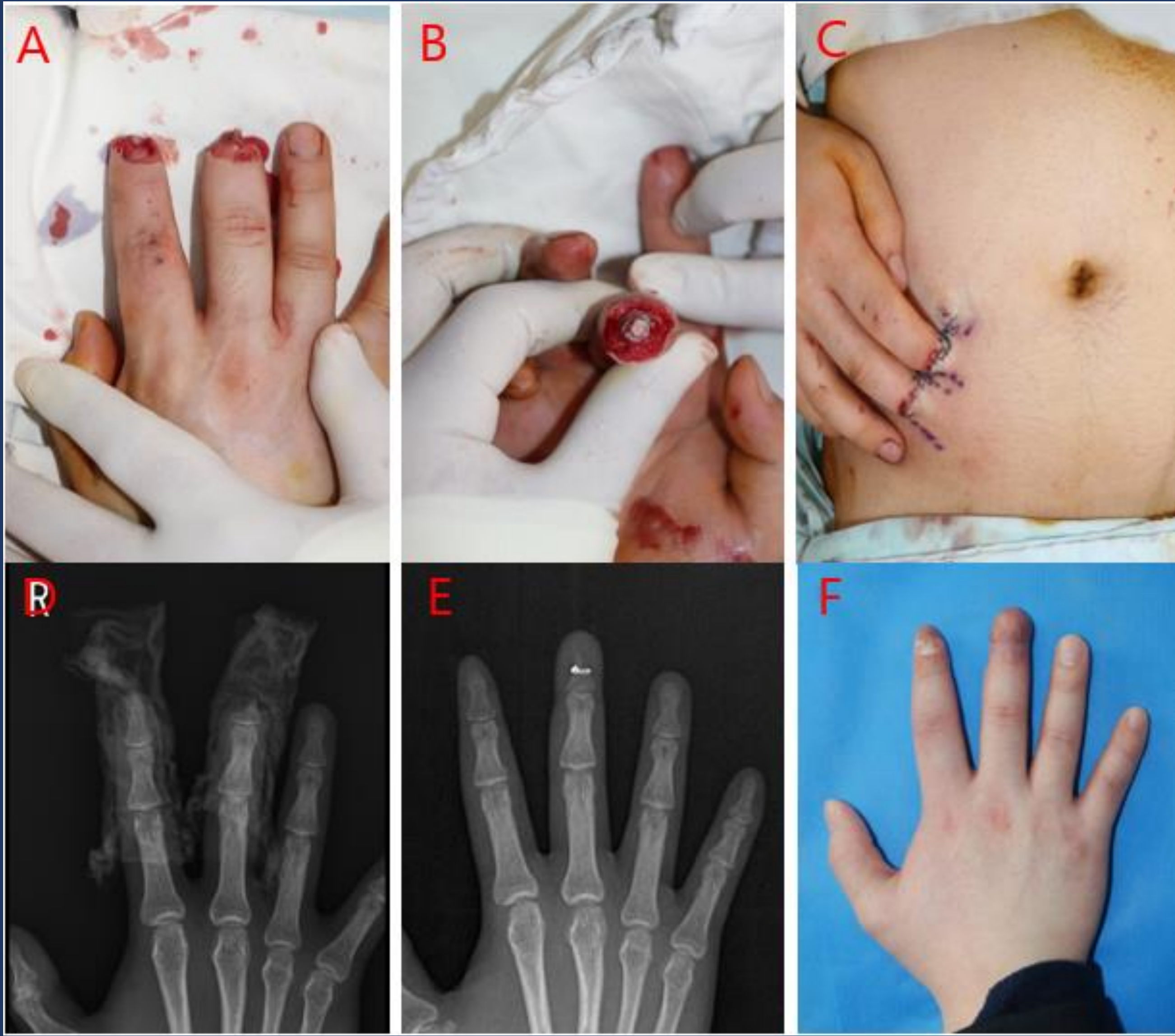
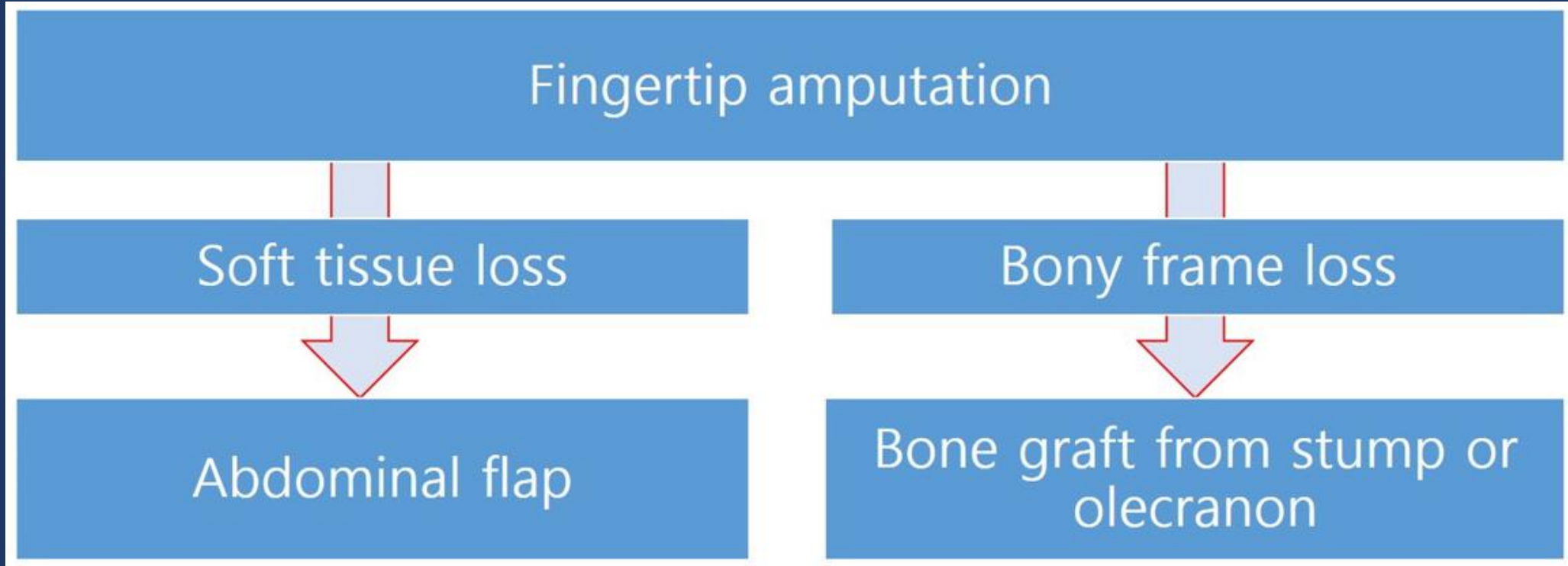
Sensory and motor recovery was monitored at the postoperative 3 months follow-up. Sensory recovery was evaluated in all patients by checking tactile, pain, cold and hot sensation at the 2nd, 4th, 8th and 12th weeks postoperatively. Motor function was assessed by measuring the range of motion of DIP joint. Overall hand function was compared between the first and the third months postoperatively by Michigan hand outcomes questionnaire (MHQ). Flap complications such as necrosis, venous congestion, infection was also studied.

Surgical techniques

All fingertip injuries involved Sebastin zone IA and IB level, as not deemed suitable for arterial anastomosis, were managed with abdominal flap for soft tissue coverage and bone graft for maintain the length of a finger under general anesthesia. For the abdominal flap design, rectangular-shaped flap with a pedicle caudally was designed along the axis of inferior epigastric vessels. It was designed in a relatively redundant area at which it could provide comfort to the patient. The width which was about 5 cm was long enough to wrap around an injured fingertip. The flap was raised above scarpa’s fascia.

If possible, an intact bone fragment from the stump was harvested, and fixated to the amputated distal phalanx with interosseous wiring or K-wire fixation. If stump was crushed and bone was not available, olecranon bone graft was performed. A 3 cm incision, after palpating anconeus and flexor carpi ulnaris (FCU) muscle, was designed 1.5cm distal to the tip of the olecranon. Anconeus and FCU muscle were identified and periosteum was incised and elevated for harvest of the olecranon. The cortical and cancellous bone was harvested together with an osteotome. The length was different depending on the amputation level. The periosteum and the skin were sutured individually.

After a bone graft was performed on the recipient site, the abdominal flap was then covered the defect and sutured with No. 5-0 Nylon sutures. A splint was used for flap stabilization, and elastic bandages and taping were employed to address the patient arm position for daily dressing and flap monitoring. All patients were encouraged to mobilize the shoulder and elbow joints. Flap division underwent after 3 weeks.



Case

A 25-year-old male experienced a fingertip amputation of the right second and third finger. His third finger was amputated on the level below lunula, which was Sebastin IB. An intact bone was harvested from the stump, and fixated via the interosseous wiring. The finger was inserted into the elevated abdominal flap which was elevated above Scarpa’s fascia in a pocket type. There were no postoperative complications. Satisfactory aesthetic and functional recovery with full range of motion of the fingers were achieved in the six months follow-up