



RESEARCH ARTICLE

RECONSTRUCTION OF DORSAL DIABETIC HAND DEFECTS BY REVERSED  
RADIAL FOREARM FLAP (RRFF)

<sup>1,\*</sup>Yasser Helmy, <sup>1</sup>Ahmad Taha, <sup>1</sup>Tarek El-Banooby, <sup>1</sup>Abdel nasser Khallaf  
and <sup>2</sup>Mahmoud Moawad

<sup>1</sup>Plastic Surgery Department, Faculty of Medicine, Al-Azhar University

<sup>2</sup>Mahmoud Moawad Vascular Surgery unit, Damietta Faculty of Medicine, Al-Azhar University

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ABSTRACT

**Background:** Dorsal hand injuries or defects in diabetic patients are usually complicated by skin loss, tendon exposure, then aggressive hand function loss. They are less common reports about this subject in literature.

**Objectives:** This study was designed to provide a clinical report and outcome observations about the use of RRFF in the reconstruction of dorsal hand defects associated with tendons exposure.

**Results:** All flaps were survived, but each case of the ten cases of the study had developed recipient and/or donor complications, but fortunately there is no complete flap loss or another major complication.

**Conclusion:** Our observations are recommending the use of RRFF as it is a reliable option in the reconstruction of the dorsal hand defects in diabetic patients, although it has a higher incidence of flap and donor site complications.

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INTRODUCTION

The Radial forearm flap is thin, pliable, and sensate flap, first described in Chinese literature, and then many modifications and indications are published. The reversed radial forearm (RRFF) flap provides an extensive coverage in hand reconstruction (Chang, 2000; Dogan *et al.*, 1999; Martinet *et al.*, 1997; Soutar, 1984; Jin *et al.*, 1985; Bardsley *et al.*, 1990; Meland *et al.*, 1993) to cover hand defects in the palm, dorsum, or first web space. Dorsal hand diabetic wound, although it is rare, it is a complicated problem and just any trivial wound became ulcerated, severe complications may develop up to tendon exposure and maceration. Frequent wound dressings and local care usually are not enough to control the mixed infection attacking the wound, in addition to recurrent skin graft loss in early ulceration if the surgeon is trying it before facing the complication of paratenon loss. If a diabetic patient has an underlying arterial pathology, any added infection may result in gangrene (Vincent *et al.*, 2010), hence proper coverage of diabetic hand infection is recommended. In this study, we used reversed radial forearm flap to reconstruct the dorsum of the hand in diabetic patients with

tendon exposure and loss of paratenon. The reason for the study is to get good coverage for dorsal diabetic hand tissue defects, and the goal is to evaluate the clinical outcome in diabetic patients, as a preliminary observation.

MATERIALS AND METHODS

Observational prospective study was designed, in period from May 2013 to April 2015, ten diabetic patients were presented by variable presentations of dorsal hand defects; 5 cases were presented with extensive tendon exposure at the dorsum of the hand, 2 cases were presented with first web soft tissue loss with tendon exposure, and 3 cases were presented by raw area on amputated diabetic hand stump. They were being scheduled for reversed radial artery forearm flap reconstruction, after informed consent, at Al-Hussein, Nasser and AL-Haram hospitals, Egypt. There were eight males and two females. Their ages ranged from 45 to 60 years with an average of 53 years. All cases were due to trivial injuries. The sizes of the flap islands varied from 4x4 cm to 10x8 cm.

Surgical Technique

The RRFF flap is performed with the patient in supine position, and a tourniquet is placed on the upper arm. The area of soft-tissue loss is prepared by debridement of all necrotic

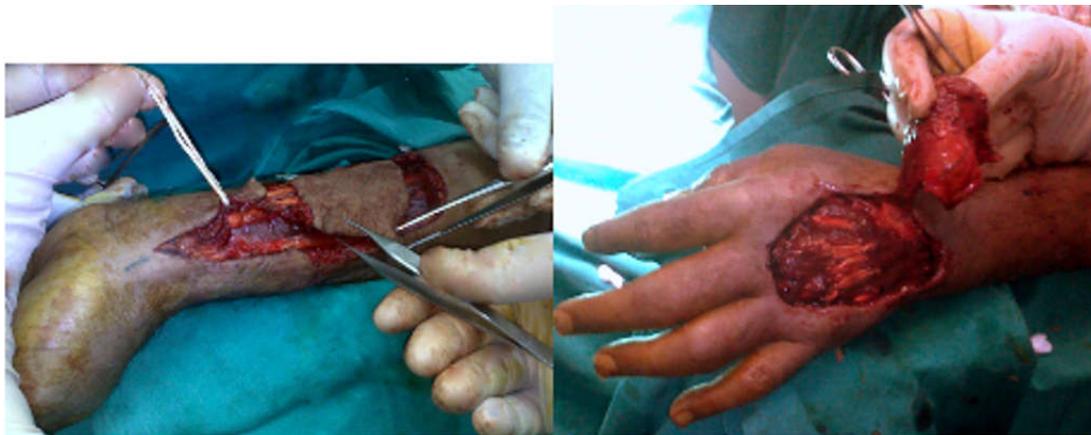
\*Corresponding author: Yasser Helmy,  
Plastic Surgery Department, Faculty of Medicine, Al-Azhar University.

tissue and vigorous washing of the wound. The radial artery perforators are identified and demarcated on the skin with a handheld Doppler device. The fascial island is centered as possible along the axis of the radial artery, extending proximally to the antecubital fossa with a distal pivot point 4 cm proximal to the radial styloid.

proximal aspect of the flap. The arc of rotation centered over the distal radio-ulnar joint. The island flap was lifted and tunneled down to the skin bridge on the radial side of the dorsum of the hand to its new position. The flap was sutured into the recipient site. The donor area was covered with a graft. Figures 1, 2 and 3.



**Fig.1 (A) Preoperative dorsal hand defect (B) Preoperative RRFF design with Extensor tendons exposure**



**Fig.2 (A) RRFF pedicle (B) RRFF turnover under skin tunnel**



**Fig. 3(A) RRFF covering the defect (B) SSG for donor site closure**

The upper limb is elevated to drain blood by help of gravity, and the tourniquet is inflated. The incision started at the proximal radial aspect of the flap over the radial artery and continued down to the deep fascia.

Radial artery taken within the flap included a cuff of fibrofatty tissue. The cephalic vein is ligated and divided at the

## RESULTS

All flaps, were survived, but each case of the ten cases of the study had developed either both recipient and /or donor complications. There were wound dehiscence in 8 cases (80%) of the study and there were partial flap necrosis and partial loss in two cases (20%) of the study. Fig. 4.

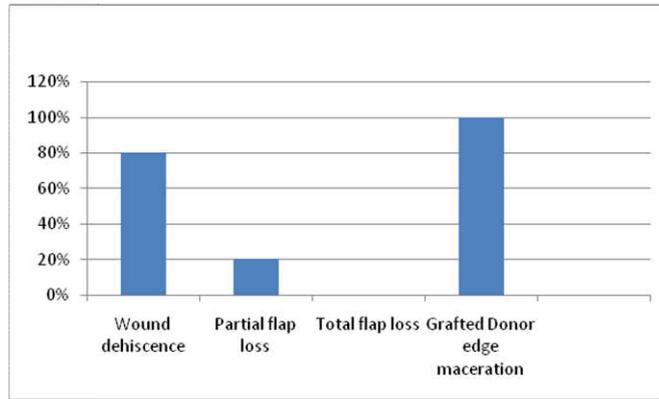


Figure 4. Incidence of complication of RRFF in dorsal diabetic hand defects



Figure 5. (Above) tissue loss in the dorsum of first web space with tendon exposure- RRFF elevation.(below) postoperative results



Figure 6. (Above) post amputee hand stump with raw area –RRFF elevation (below) postoperative results

But we didn't report any complete flap loss, tendon re-exposure, gangrene, infection or septicemia. All Complications were managed conservatively by the local oily base ointment, wide approximating secondary sutures, control of general condition, and debridement when indicated. All donor sites were complicated by maceration of skin graft edges, but no infections, and also managed conservatively. We had achieved, complete wound healing and near normal hand function, or functional stumps which have good skin quality and it had been suitable for further prosthesis, and we got accepted aesthetic results. Figures 5, 6.

**DISCUSSION**

Diabetic hand, has to date, not been considered as a common complication of diabetes and no precise definition for it can be found in the literature.

Papanas and Maltezos, (2010) suggesting that Diabetic hand could be defined as a syndrome of musculoskeletal manifestations of the hand in diabetic patients. Although limited joint mobility, Dupuytren's contraction and trigger fingers are the most common publishing conditions of the diabetic hand. Hand ulcer with infection can cause more serious complications such as gangrene (Gill *et al.*, 1998) amputation (Tiwari *et al.*, 2008; Mann, 1977) or even death (Archibald *et al.*, 1997). Hand ulcer with the infection in diabetic patients was first described in the USA in 1977 (Mann, 1977) However, since 1983, the subsequent majority of reports (Akitewe *et al.*, 1983) come from African countries, and hand ulcer with infection are termed the tropical diabetic hand syndrome (Gill *et al.*, 1998). Complex soft tissue defects of the diabetic hand requiredvascularized tissue for protection and coverage of exposed underlying structures. Pedicled local

flaps from the forearm is recommended as a reconstructive option, but its use is limited by relatively high donor-site problems. The traditional RRFF flap coverage is extensively done in hand surgery (Chang, 2000; Doganet *al.*, 1999; Martinet *al.*, 1997; Soutar, 1984; Jinet *al.*, 1985; Bardsleyet *al.*, 1990; Melandet *al.*, 1993) but no reports about its use in diabetic patients.

The general role in surgical management of the hand infection in diabetics was early, aggressive and specialized to avoid the drastic outcome in the form of loss of vital hand craft. There are no any observations in literature, up to date, about use of RRFF in the reconstruction of dorsal diabetic hand ulceration. Our observations are preliminary first worldwide step which could encourage for use of RRFFreconstructed dorsal diabetic hand tissue loss. There were wound dehiscence in 8 cases (80%) of the study and there were partial flap necrosis and partial loss in two cases (20%) of the study. Fortunately, there were not any cases complicated by complete flap loss, tendon re-exposure, gangrene, re-infection or septicemia, and the partial loss of the flap was submitted for debridement and managed conservatively. All partial dehiscence was managed by the local oily base ointment, and control of general condition. Donor site healing was accepted, although, skin graft edges maceration of all cases, and healed by epithelialization and wound contraction but no infections happened. Above observations could be consider and submit for wide scale extensive study about use of RRFF in the reconstruction of the dorsal diabetic hand wound.

### Conclusion

In the risk benefit balance paraphrase, this study concludes that (RRFF) is really areliable option in the reconstruction of the dorsal defects in the hand of diabetic patients, although its higher incidence of flap and donor site complications. All complications are not major and controllable.

### Conflict of interest

Authors 1, and Author 2, declare that they have no conflict of interest.

### Ethical standard

The Ethical committee of Al-Azhar University approved the study protocol and an informed consent was taken from all patients.

All persons gave their informed consent prior to their inclusion in the study.

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