Reconstruction of a palmar infection related tissue defect with heterodigital island flap in a diabetic patient: A case report

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ABSTRACT

Hand infections are particularly important in diabetic patients, because of the rapid progression and high risk of morbidity. Infections should be treated emergently with sufficient debridement and appropriate antibiotics. Comorbid situations, type of infection and late intervention are important predisposing factors to complications such as tissue necrosis. Tissue defects should be reconstructed with a similar tissue that does not cause movement restrictions or contractures that have adequate thickness. In this study, heterodigital island flap in reconstruction of a palmar defect caused by infection in a diabetic patient is presented.

Key words: Finger reconstruction, heterodigital island flap, palmar infection

Introduction

Soft tissue infections of the hand have been important factors for morbidity and mortality in diabetic patients [1]. Vascular insufficiency, immune deficiency and predisposition to trauma have been the major problems causing acute soft tissue infections of the hand. Infections in these patients have a tendency to spread wide areas via anatomical spaces. Additionally; skin necrosis could be seen according to infectious agents [2,3]. For this reason early surgical debridement has been the most important factor in preventing the spread of infection. After the acute phase of the infection, the resulting defect should be reconstructed with a reliable and functional method that is chosen taking into consideration the location and depth of the defect [4].

The heterodigital island flap for reconstruction of a hand defect after infection in a diabetic patient is presented in this study.

Case Report

A 55 years old woman referred to our clinic with erythema, edema and pain in the hand. She was diabetic for approximately 10 years but she was not taking any medication. Her complaints began after an injury with a thorn of a plant. Two days after the beginning of the complaints she went to a primary health care center and oral antibiotic treatment with Amoxicillin-Clavulanic acid was administered. Erythema and edema in the left hand and infectious necrotic tissue from second web space to the third finger were seen in physical examination (Figure 1). There was pain with passive motion of the fingers. Hypoesthesia on all fingers was noted. No other systemic comorbidities except diabetes mellitus were detected. Urgent surgical debridement of the necrotic tissues was planned. Necrotic tissues over the second web space through third finger debrided under wrist bloc anesthesia. Midpalmar space was drained...
and irrigated with saline. Fasciotomies to the second and third fingers and dorsum of the hand were made to decrease the compartmental pressures. Vancomycin resistant enterococcus was the cultured agent from the wound cultures. Intravenous antibiotics (Piperacillin-Tazobactam 3,5gr/day) were administrated. The edema and erythema regressed gradually after the operation.

Wound dressings with antibiotic pomades were made on a daily basis. A 3x2 cm defect on the proximal phalanx of the third finger and the distal part of the palm with flexor tendon exposition was found. Reconstruction with heterodigital island flap from the radial side of the fourth finger proximal phalanx was planned. Bilateral digital arteries of the fourth finger were checked for patency with Allen test and Doppler ultrasonography. The heterodigital island flap from the radial side of the fourth finger was elevated under infiltration anesthesia. The vascular pedicle was dissected until the bifurcation and the flap was inserted to the defect on the third finger. Defects on the palmar area were primarily repaired. A full thickness skin graft taken from the inner arm re-
region was put on the donor area (Figure 2). There was minimal contracture on the second web space in the postoperative 8th month (Figure 3). Motor functions were found to be in the normal range. Postoperative evaluation of sensation in the fingertips remained the same as in the preoperative state, except for a decrease in the radial part of the fourth finger.

**Discussion**

Diabetes mellitus could make predisposition to infections by effecting cellular immune mechanisms especially in patients without normoglycemic control. Cellular immune deficiency and microangiopathic changes have an impact on developing infections in the areas that are prone to trauma [5, 6]. The hand is a potential source of infection for diabetic patients with frequent traumatic injuries and the presence of anatomical spaces can result in rapid progression of these infections [2]. These infections could lead to defects that need to be reconstructed with carefully chosen methods. There are many reconstructive methods including skin grafts, local and regional flaps. Discussing the importance of the heterodigital flap as a reconstructive option was aimed in this study. Reconstruction of the defect should be made after the acute phase of the infection. Although some authors have revealed no increase in the incidence of hand infections in diabetic patients; Houshian et al. has observed a six times increase in the diabetic patients [1, 7]. In the study of Yacoubi et al. an increase in E. coli growth in wound cultures in diabetic patients was observed [8]. Mixed flora composed of gram positive, gram negative bacterial and fungal agents were isolated in 52% of patients in the same study. It is remarkable that none of 111 patients in the study by Yacoubi et al. was presented with Vancomycin resistant enterococcus infection.

Early surgical intervention is crucial for hand infections in diabetic patients. The infection with the potential of rapid spreading between anatomical spaces can be regressed with appropriate debridement. The amputation ratio of one or more fingers in diabetic patients with hand infections is around 14% - 35% [6, 9]. In today’s clinical practice salvaging the finger should be the main purpose of treatment. Even with prompt intervention and treatment morbidities such as tissue defects can occur. In these circumstances, reconstruction should be made regarding the location and the size of the defect after total elimination of the infection. Skin grafts, local, regional or free flaps are the options for reconstruction of hand defects. Exposition of the vital tissues should also be considered when the decision for reconstruction is made. Reconstructive algorithms for defects of specific areas in hand are well described [4, 10]. The defects related with infections can be located on multiple atypical regions thus requiring specific reconstructive plans. The infection at the palmar region and third finger resulted in a defect on volar side of third finger through second web space and distal palm with exposition of the flexor tendons and the neurovascular bundles in the presented case. Our choice was to close the defect with pliable and durable tissue, which could allow free tendon movement and also cover the exposed neurovascular bundles. The skin grafts were not suitable because of the exposed structures. Local flaps that could be planned around the defect were not suitable because of possible infection. Distant flaps like abdominal interpolation flaps were not chosen as first-line reconstructive option because they involve two stage operations.

The heterodigital island flap from the radial part of the fourth finger was first described by Littler in 1953 for thumb defects. Later it was used for other parts of the hand since it provided sensorial tissue for reconstruction [11-15]. The main disadvantage of this flap is the sacrifice of the neurovascular bundle of the digit in one side. Checking the patency of both digital arteries with Allen test and Doppler ultrasonography has vital importance. Improvement of the sensibility in the recipient finger could be an advantage for patients. However, in patients in whom the loss of sensibility cannot be tolerated, as in sophisticated workers, the morbidity at donor finger should be kept in mind. In our case the patient had decreased sensation in all fingers, which caused her not to realize the thorn in her hand in the early trauma period. Even though the sensation of radial side of the 4th finger was sacrificed, no remarkable decrease in the sensation was noted and a successful closure of the important anatomical structures in the 3rd finger was also achieved.
To conclude, hand infections can cause skin necrosis in large areas by rapid spreading in diabetic patients. The reconstructive option for the atypical defect should be chosen individually for every patient. Heterodigital island flap can be a reliable reconstructive option in these cases.

References
1. Fitzgibbons PG, Weiss AP. Hand manifestations of diabetes mellitus. J Hand Surg Am 2008;33:771-5.
2. Clark DC. Common acute hand infections. Am Fam Physician 2003;68:2167-76.
3. Kieffer W, Gallagher K, Rogers B, Leonard L. Hand infections. Br J Hosp Med (Lond) 2013;74:124-7.
4. Horta R, Silva P, Costa-Ferreira A, Amarante JM, Silva A. Microsurgical soft-tissue hand reconstruction: an algorithm for selection of the best procedure. J Hand Microsurg 2011;3:73-7.
5. Gill GV, Famuyiwa OO, Rolfe M, Archibald LK. Serious hand sepsis and diabetes mellitus: specific tropical syndrome with western counterparts. Diabet Med 1998;15:858-62.
6. Pinzur MS, Bednar M, Weaver F, Williams A. Hand infections in the diabetic patient. J Hand Surg Br 1997;22:133-4.
7. Houshian S, Seyedipour S, Wedderkopp N. Epidemiology of bacterial hand infections. Int J Infect Dis 2006;10:315-9.
8. Yacoubi A, Al-Shobaili H. Clinical and Microbiological Characteristics of Hand Infection in Diabetic Women in Qassim University Hospital, Saudi Arabia. Ibnosina Journal of Medicine and Biomedical Sciences 2013;6:85-90.
9. Connor RW, Kimbrough RC, Dabezies MJ. Hand infections in patients with diabetes mellitus. Orthopedics 2001;24:1057-60.
10. Weichman KE, Wilson SC, Samra F, Reavey P, Sharma S, Haddock NT. Treatment and outcomes of fingertip injuries at a large metropolitan public hospital. Plast Reconstr Surg 2013;131:107-12.
11. Aygit AC, Afsar Y, Oz bey B, Bas S. [Lokal Norovasküler Ada Flebi ile Pulpa Rekonstrüksiyonu] [Article in Turkish]. Turk Plast Surg 2003;11:86-90.
12. Hashem AM. Salvage of degloved digits with heterodigital flaps and full thickness skin grafts. Ann Plast Surg 2010;64:155-8.
13. Littler JW. The neurovascular pedicle method of digital transposition for reconstruction of the thumb. Plast Reconstr Surg (1946) 1953;12:303-19.
14. Rose EH. Local arterialized island flap coverage of difficult hand defects preserving donor digit sensibility. Plast Reconstr Surg 1983;72:848-58.
15. Acar MA, Guzel Y, Gulec A, Turkmen F, Erkoçak ÖF, Yilmaz G. The Results of Reconstruction of Fingertip Injuries Using Homodigital Flap. Hand Microsurg 2014;3:39-46.