INTRODUCTION

Treatment of complicated fractures and soft tissue defects of the lower extremity depends on many factors such as the energy of the trauma, the anatomical location and the morphology of the wound, concomitant injuries and diseases and the age of the patient. With rapid advances and increased success rates, microvascular surgery became a preferred method in clinical practice. As there is a wide variety of cosmetic and functional alternatives, the traditional treatment strategies changed especially in lower extremity reconstruction.\(^1\)\(^2\) The major advantages of microvascular surgery are single stage operation, minor donor site morbidity, numerous donor flap alternatives, early mobilization and reconstruction with tissue with well circulation.\(^1\) Besides the advances in microvascular technique and operation instruments, there are still flap failures and there has not been accepted procedures to prevent flap failure.\(^1\)\(^2\)

ABSTRACT

Landmine injuries of the lower extremity constitute a challenging problem to the reconstructive surgeon. These injuries create composite tissue defects which are always contaminated. The transfer of the patient to a well established center generally takes time. All these factors yield a delay at the definitive treatment of the patient. Here, we want to present 109 patients injured by landmine explosions and treated at different times and discuss the effect of timing of the microvascular tissue transfer on success of the procedure. All patients were injured due to landmine explosion and reconstructed with microvascular tissue transfer. The flap success rate and postoperative complications were evaluated.

The average follow-up period was 19 months. Of the 109 patients 12 were operated between 0-7 days (at the acute period). Forty-two of them were operated at the subacute period (between 7-14 days) and the remaining 55 were operated at the chronic period (more than 14 days). There was no flap loss at the patients whom were operated between 0-7 days. Flap failure rate was 16.7 % and 14.5 % for the subacute and chronic periods respectively and the difference was not significant. No postoperative infection was observed at the acute period. Postoperative infection rate was 16.7 % and 7.3 % at subacute and chronic period respectively, and the difference was statistically significant. When the surgery is performed according to microvascular principles subacute period does not differs from chronic period when the flap failure is concerned. Subacute period is associated with a higher infection rate.

Keywords: Lower extremity, Reconstruction, Microsurgery, Timing
In this study, we retrospectively analysed 109 microvascular lower extremity reconstructions due to gunshot wounds, performed in Gulhane Military Medical Academy Plastic and Reconstructive Surgery Clinic and evaluated the timing of the free tissue transfers. We aimed to find the relationship between the timing of the operation and flap success and other complications.

**MATERIAL AND METHOD**

One hundred and nine microvascular lower extremity reconstructions, performed in Gulhane Military Medical Academy Plastic and Reconstructive Surgery Clinic were retrospectively evaluated. Epidemiologic features, medical histories, operative details and complications were evaluated.

The mean age of the patients was 23 (range, 19-44 years). All of our cases were male. Of the 109 cases, 60 were smokers and none had problems with alcohol. The etiologies of wounds were gunshot in 16 cases and mine explosion in 93 cases. Only gunshot and missile wounds were included to the study, traffic accidents, crush syndromes, replantations and fractures with soft tissue damage were excluded. Immediate reconstruction of the defect was preferred but this was not possible for every case.

The treatment procedure started with radical soft tissue debridement and revision the bony structure. After cleaning and irrigating the wounds bony fragments and foreign bodies were cleaned. The resulting defect, therefore, was always much larger than the preoperative one. For all of our cases X-rays were taken, and in order to evaluate vascular status angiographies and ultrasonic Doppler angiographies were performed if needed. Fixation with K-wires or external fixators was done for fractures and joint injuries. Dextran was used as an antithrombotic agent after anastamosis at 35 cc/h. Flap monitoring was performed with clinical observation (color, temperature and capillary refilling), laser Doppler flowmeter and ultrasonic Doppler.

The patients were categorized into acute, subacute and chronic period patients according to the time of the free tissue transfer. The acute period was the first 7 days following the trauma. Subacute period was between 7-14 days. Microsurgical operations were at the chronic period if they were performed 14 days or more than later.

**RESULTS**

The foot defects were classified according to Shaw and Hidalgo and all were type III wounds. The other lower extremity wounds were Gustillo type III or IIIa wounds. When epidemiologic features are considered, there were no difference between the groups.

Of the 109 patients, 12 were operated between 0-7 days (at the acute period). Forty-two of them were operated at the subacute period (7-14 days) and the remaining 55 were operated at the chronic period (later than 14 days). There was no flap loss at the patients whom were operated between 0-7 days. Flap failure rates were 16.7 % (n=7) and 14.5 % (n=8) for the subacute and chronic periods respectively, and the difference was not statistically significant (p>0.05). No postoperative infection was observed at the acute period. Postoperative infection rates were 16.7 % (n=7) and 7.3 % (n=4) at the subacute and chronic periods respectively and the difference was statistically significant (p<0.05).
emergency or the importance of the radical debridement and early tissue coverage within the first 72 hours. Lister and Scheker \(^1\) reported the first case of an emergency free flap transfer to the upper extremity in 1988 and they defined the emergency flap as a “flap transfer performed either at the end of the primary debridement or within 24 hours after the injury”. \(^1\) Yaremchuck et al recommended that flaps be transferred between 7 to 14 days after injury and after several debridements. \(^1\) The argument in favor of this approach is that the zone of injury, which may often not be apparent at presentation, can be determined by serial debridement performed in the operating room over several days. Acute coverage by day 5 to 7 is generally accepted as having a good prognosis in terms of decreased risks of infection, flap survival and fracture healing. \(^1\) There is several studies advocating that early aggressive wound debridement and soft-tissue coverage with a free flap within 5 days reduced postoperative infection and decreased flap failure, nonunion and chronic osteomyelitis. \(^1\) In our series, only gunshot and missile wounds were included to the study. Traffic accidents, crush syndromes, replantations and fractures with soft tissue damage were excluded. So our series were composed of more severe and contaminated wounds. Despite the adverse wound conditions, flap success was not effected in subacute and chronic periods. This was probably due to strictly adherence to microsurgical rules, as all anastomosis were performed out of the zone of injury and vein grafts were used where needed.

The exact classification of timing of the microsurgical lower extremity reconstruction is a matter of debate. Byrd, Yaremchuck and Godina advocated different classifications. \(^1\) We think that the classification must reflect the pathophysiologic findings. As histologic changes of post-traumatic vessel disease occurs at the first 7 day, this period is thought to be acute period. The following 7 days were characterized by inflammation at the perivascular space and this period is thought to be subacute period. The period following 14 days of injury, the perivascular inflammation reaches to a plateau and begins to decrease. This period is thought to be chronic period. Our classification resembles to Byrd et al\(^1,19\) Acute reconstruction of the lower extremity is advised as all authors. But this is not possible in all cases. According to our findings, in delayed cases timing of the operation has no effect on flap success but free tissue transfers performed at the subacute period has more infections.

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