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Emergency and delayed microsurgical salvage of traumatic lower extremities

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Ethics Committee Approval
The study was approved by the Ege University Faculty of Medicine Local Ethics Committee of Clinical Studies (EGE-TAEK, https://aek-med.ege.edu.tr/index.php) on 09/17/2021, with approval number 21-9T/1.
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

Conflict of Interest
No conflict of interest was declared by the authors.

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Abstract

Background/Aim: The power of free flaps for lower extremity injury reconstruction is no longer a matter of debate; however, contrasting views remain regarding the timing of reconstruction. The mainstay article of Godina reported that reconstruction within the first three days after injury was more advantageous than surgery at later times, but different views about the best day for reconstruction have also been described in the literature. With developments in the field of microsurgery, plastic surgeons have become more experienced, shortened the times needed for surgery, and achieved flap success. We have also become more experienced with surgical times, and reconstruction on the day of injury has been performed as an emergency reconstruction (ER) procedure since 2018. However, despite the disadvantages of a delayed wait period, patients still experience delayed reconstruction (DR) due to their pre-operative conditions and dispatches from peripheral centers over delayed time periods. This study aimed to present our experiences with lower extremity reconstruction in emergency situations and after delayed periods with descriptions of technical tips for each situation.

Methods: Between 2018 and 2021, patients who underwent lower extremity reconstructions were examined as retrospective case-control study. Twenty-four patients (17 male and seven female) underwent lower extremity reconstructions with microsurgical free flap coverage. Patients' ages ranged from 6 to 75 years old. Ten patients underwent ERs (on the day of injury), and 14 patients underwent DRs. Twenty anterolateral thigh, two medial sural artery perforator, one latissimus dorsi, and one radial forearm flaps were chosen for reconstructions. Flaps were chosen for one-third of the distal lower extremity reconstructions (n=11) and Gustilo type 3B injuries (n=11), Gustilo type 3C injuries (n=1), and one-third for middle lower extremity soft tissue reconstructions (n=1). Infections, length of hospital stays, time spent during the reconstructive surgery, vascular complications, and additional debridement necessity counts were recorded and compared with previous statistical analyses.

Results: One venous thrombosis in the emergency group and three venous and one arterial thrombosis in the delayed group were reported. The patients were taken to the operating room immediately after which re-anastomoses were performed successfully, and all flaps survived. The hospital stay was between 4 and 60 days in the emergency group and 20 and 99 days in delayed group. Infections (P=0.03), vascular complications (P=0.04), and hospital stays (P=0.01) were statistically significantly lower in the emergency group than in the delayed group.

Conclusion: ER has many advantages, such as preventing time consuming surgeries and providing short hospital stays and low complication rates, over DR. However, DR is inevitable for some reasons, and despite its more complicated nature, meticulous flap follow-up and salvage procedures may provide the same flap success as found with ERs.

Keywords: delayed reconstruction, free flap, emergency reconstruction, lower extremity reconstruction

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Introduction

Traumatic lower extremity defects may be very challenging even for the experienced microsurgeons. Unlike head and neck, breast, or genital area reconstructions, which are usually elective and planned surgery, lower extremity injuries are generally performed by trauma surgeons in an emergency setting. However, these unexpected cases must be given the utmost consideration as they can result in major morbidities [1].

While the power of free flaps is no longer a matter of debate for reconstruction of lower extremity injuries, contrasting views remain regarding the timing of reconstruction [2]. Godina's 1986 study, in which the reconstructive time intervals were divided into the first three days, from three days up to three months, and more than three months, remains the mainstay in the literature. His study demonstrated that free flap surgery was more successful when performed in the first three days compared to the period of three days to three months since complications such as infection and flap failure were more frequent during the latter period [3]. Subsequent studies focused on investigating the correct timing for reconstruction, and many achieved more or less the same results as Godina [4,5]. However, Godina's 3-day cut-off was also modified in some studies [6].

One of the approaches is performing the reconstruction as rapidly as possible on the day of injury without waiting over the 3-day acute period as previously described by Godina . This newer method includes performing the reconstruction as an emergency protocol on the day/night of the injury. A large portion of lower extremity injuries tend to be admitted after working hours. Although it is more physiologically useful to cover exposed bone, tendon, or muscle with vital tissues as soon as possible, managing such complex surgeries during after-hours is not always possible [7,8]. Apart from the conditions of patients that dictate delayed surgery, some restrictive problems for emergency reconstruction, such as inadequacy of surgical equipment, operative staff fatigue, surgical experience, long operation times, and other factors, exist. Waiting for settlement of wound demarcation and the necessity of serial debridement is another advocated reason to wait [9].

In our previous algorithm, debridement and bone fixation were done as emergency procedures by orthopedic surgeons, and the patient was followed with a dressing as the first approach. The surgical plan for the patient should be determined as soon as possible. However, despite the advantages of acute reconstruction mentioned above, finding an early operation day for the patient is not always possible due to extensive surgical schedules and the length of the surgery to be performed. However, with developments in microsurgery, surgeons are becoming more experienced daily, and our center has also followed this evolution. An emergency microsurgery team was formed in 2018 with the aim of shortening operation times and increasing flap success. However, life-threatening conditions and patients that are referred late from peripheral centers are reserved for delayed surgery. This study aimed to present our experience of emergency and delayed microsurgical reconstructions with descriptions of technical tips for each situation.

Materials and methods

The Ege University Faculty of Medicine ethical committee approved this study with approval number 21-9T/1 on 09/17/2021. Patients who underwent surgery on for lower extremity soft tissue free flap reconstructions between 2018 and 2021 were retrospectively analyzed. Patients with lower extremity defects due to oncological surgery or trauma cases that were reconstructed without free flaps were excluded from the study. Twenty-four patients (17 male and seven female) were found to have free flap coverage for lower extremity injury. Twelve of 24 patients were referred to our emergency department on the day of trauma, and 12 were referred from other centers and were delayed. After detailed examination, two of twelve patients were not feasible candidates for emergency reconstruction because of subarachnoid hematoma in one case (Figure 1, 2) and drug abuse in the other, so they became delayed reconstruction (DR) candidates. The emergency reconstruction group (ER) consisted of 10 patients who underwent single-stage reconstruction: (1) debridement, (2) bone fixation if necessary, and (3) emergency free flap coverage by orthopedics and our team after-hours. Debridement was done until vital tissue was reached, and bleeding was accepted as the reference for stopping. Intramedullary nails, external fixators or plates, and screws were used as fixation tools. Free flap coverage started when orthopedic surgeons had finished their surgery, and the starting time of reconstructive surgery was recorded. Fourteen patients in the DR group underwent surgery based on a similar protocol that was done electively during working hours. All emergency and delayed patients underwent pre-operative computerized tomography angiography (CTA) for vascular assessment.

Anti-thrombotic agents were administered to all patients without early hematomas during the fourth post-operative hour. Frequent flap monitoring was carried out by experienced staff. The bone reconstruction stage was not included in the tables and statistical analyses in the study because the soft tissue had entirely healed. Patients were further analyzed for classical measures from similar studies: (1) surgery time, (2) infectious complications, (3) vascular complications/flap loss, (4) hospital stay, and (5) the necessity for an additional debridement [3,4].

Statistical analysis

The software SPSS v. 25.0 was used to conduct statistical analysis (IBM, Chicago, IL). Mann–Whitney U and *Chi-Square* tests were used to examine operative and post-operative values between two groups, and *P*-values <0.05 were accepted as statistically significant.

Figure 1: Patient No 1 in the delayed reconstruction (DR) group: A 6-year-old male patient was referred to our emergency department because of a motor vehicle accident. Emergency reconstruction (ER) was abandoned because of additional cranial damage. Image at the emergency department (A), After initial debridement and bone fixation, the wound was followed with dressing (B), Peri-operative image for soft tissue reconstruction, 17 days after injury (C), Harvested 18 x 11 cm anterolateral thigh (ALT) flap with single perforator (D), Reconstruction of exposed bone with ALT flap and granulation tissue with a split-thickness skin graft (E), Post-operative 19 months reconstruction (F). The patient was re-operated on the post-operative first day because of venous thrombosis. Salvage was done with excision of thrombotic vessel segment and venous re-anastomosis with a vein graft.

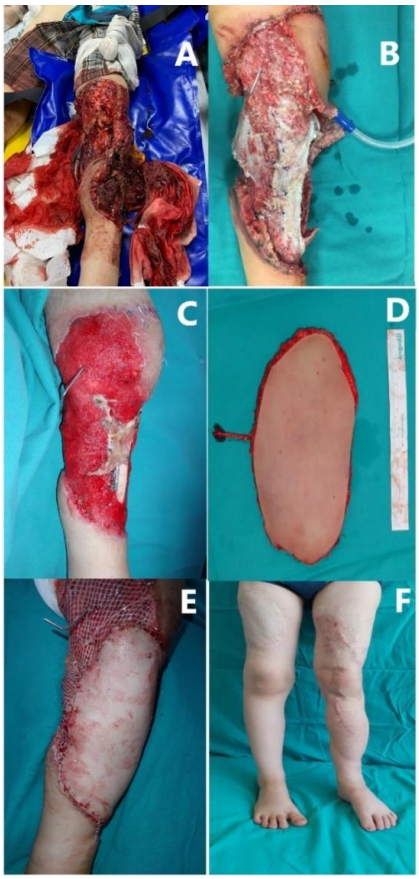
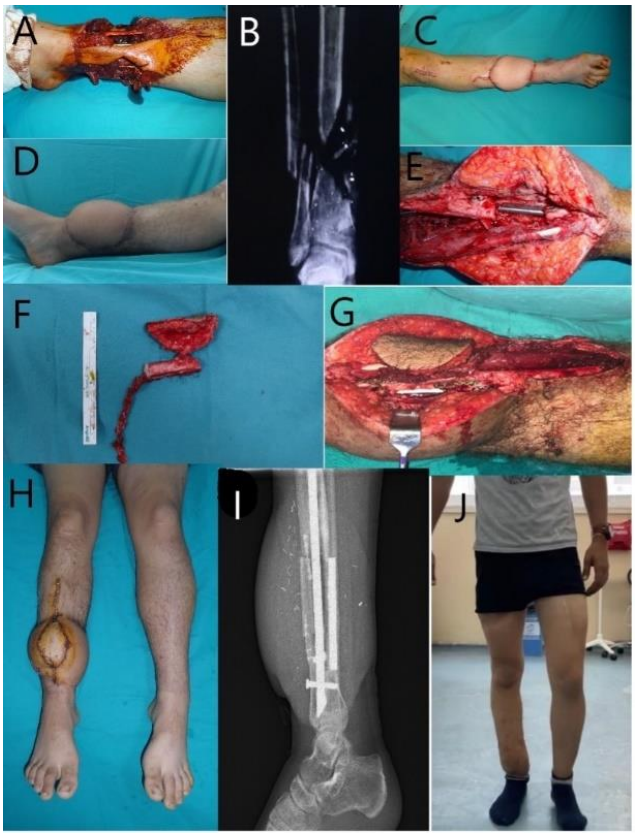


Figure 2: Patient No 4 in the ER gourd: A 22-years-old male patient was referred to our emergency department because of a gunshot injury. Bone fixation with intramedullary nailing (A), Pre-operative x-ray image of right distal tibia and fibula (B), Same sitting emergency soft tissue reconstruction with ALT flap after adequate sharp debridement, the pedicle of ALT was anastomosed to the anterior tibial artery (C), Post-operative 2 months after soft tissue reconstruction (D), Incision of completely healed ALT flap for bone reconstruction and defect of the tibia (E), Harvested free fibula flap with small skin paddle for flap monitoring(F), Inset of free fibula flap for bone reconstruction and supporting intramedullary nail, the pedicle of fibula flap was also anastomosed to the anterior tibial artery, proximal to first flap anastomosis line (G), Post-operative three weeks after bone reconstruction with ALT flap and skin paddle of fibula flap (H), X-Ray graph of bone reconstruction 3 weeks postoperatively (I), Post-operative two years after total reconstruction (J).



Results

Patient demographics are summarized in Table 1.

Infection

One patient in the ER (10%) and 5 patients in the DR (35.7%) groups had infections after surgery (Table 2). Internal plate and screws were removed, external fixation was applied to the patient in ER, and infection was handled with appropriate antibiotic protocols as was done for delayed infected patients. All infections were managed successfully except for one uncontrolled diabetes case in the DR. Despite a successful free flap survival on this patient; the extremity was amputated below the knee because of disseminated infection on the post-operative 25th day (P=0.03).

Vascular complications and flap loss

One patient (10%) in the ER group had venous thrombosis. In the DR group, three venous (21.4%) and one arterial thrombosis (7.1%) occurred after surgery. All vessels became patent with vein grafts, and all flaps were salvaged. The DR group had a higher complication rate (28.6%) than the ER group, and this difference was statistically significant (P=0.04).

Hospital stay

The minimum–maximum days of hospital stay ranged from 4 to 60 days, and the median value was 16 days in ER. The median value of the DR group was 40 days, and the minimum–maximum days ranged from 20 to 99 days. Hospital stays were longer with statistical significance in the DR group (P=0.01).

Reconstructive surgery time

Surgery time was recorded as the initial surgery. The time for flap salvages or additional debridement times were not recorded. The range of operative times was 2.5–4 h for the ER and 3.5–8 h for the DR groups. The median value was 3 h in the ER and 4.25 h in the DR groups. No statistical differences between groups were noted (P=0.16).

Additional debridement

One patient in the ER group (Figure 3) and two in the DR group had additional debridement. This parameter was not statistically significant between groups (P=0.33). All debridement were performed because of infections.

All results are summarized in Tables 2 and 3.

Table 1: Summary of patient demographics

Emergency Reconstruction	Sex	Age	Time of injury to free flap (day)	Comorbidity	Mechanism of injury	Type of Free Flap	Injury
Patient 1	Male	54	0	Tobacco+, HT	MVA	ALT	Distal 1/3 STD
Patient 2	Male	26	0	Tobacco +	MCA	ALT	Distal 1/3 STD
Patient 3	Male	24	0	Tobacco+	GSW	ALT	Distal 1/3 STD
Patient 4	Male	22	0	Tobacco +	GSW	ALT	Gustillo Type 3B
Patient 5	Male	17	0	None	MCA	ALT	Gustillo Type 3B
Patient 6	Male	26	0	Tobacco +	MVA	ALT	Gustillo Type 3B
Patient 7	Male	33	0	Tobacco +	MVA	ALT	Gustillo Type 3B
Patient 8	Female	50	0	HT	MVA	MSAP	Distal 1/3 STD
Patient 9	Male	36	0	Tobacco +	MCA	ALT	Gustillo Type 3B
Patient 10	Female	32	0	None	MCA	ALT	Distal 1/3 STD
Delayed Reconstruction							
Patient 1	Male	6	17	None	MVA	ALT	Gustillo Type 3B
Patient 2	Female	75	14	DM, HT, Tobacco +	MVA	ALT	Gustillo Type 3B
Patient 3	Male	64	60	DM, HT, BPH	MVA	ALT	Gustillo Type 3B
Patient 4	Female	30	32	None	GSW	MSAP	Gustillo Type 3B
Patient 5	Male	56	72	Tobacco+	MCA	ALT	Distal 1/3 STD
Patient 6	Male	10	33	None	MVA	ALT	Distal 1/3 STD
Patient 7	Male	42	34	Thrombocytosis	GSW	ALT	Distal 1/3 STD
Patient 8	Female	48	35	Tobacco +	MCA	ALT	Gustillo Type 3B
Patient 9	Male	38	21	Tobacco +	GSW	ALT	Distal 1/3 STD
Patient 10	Female	43	60	None	FFH	RFF	Distal 1/3 STD
Patient 11	Female	36	64	None	MVA	Latissimus Dorsi	Gustillo Type 3B
Patient 12	Male	54	33	None	MVA	ALT	Distal 1/3 STD
Patient 13	Male	23	39	None	MVA	ALT	Gustillo Type 3C
Patient 14	Male	34	24	None	MVA	ALT	Middle 1/3 STD

HT: Hypertension, MVA: Motor vehicle accident, MCA: motorcycle accident, GSW: gunshot wound, FFH: Fall from height, ALT: Anterolateral thigh flap, MSAP: Medial sural artery perforator flap, RFF: Radial forearm flap, STD: Soft tissue deficit, DM: Diabetes mellitus, BPH: Benign prostatic hyperplasia

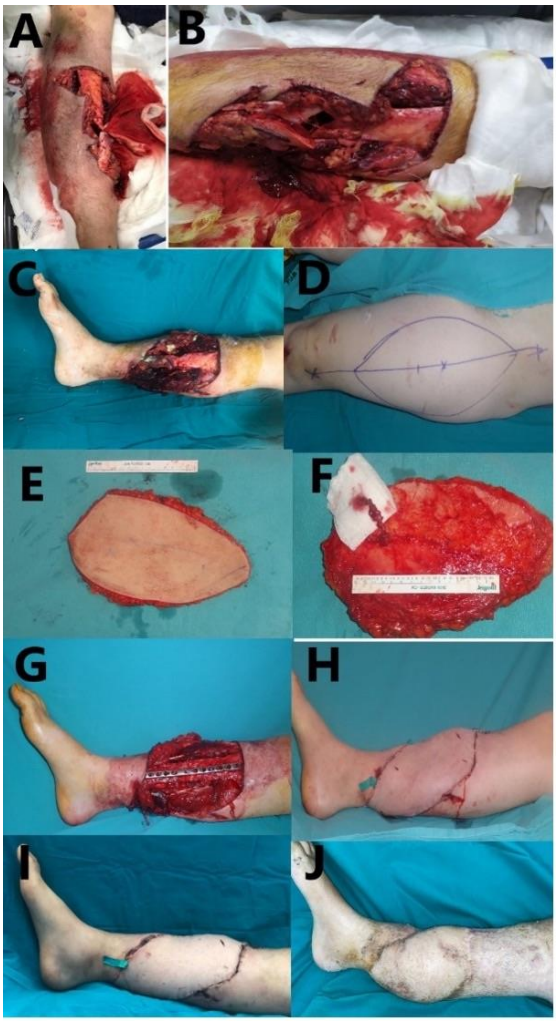
Table 2: Results of emergency and delayed group patients

Emergency Reconstruction	Length of Stay in Hospital (days)	Infection	Vascular Complication	Flap failure	Number of Additional Debridement	Time of Surgery for Reconstruction(hours)
Patient 1	13	None	None	None	0	2.5
Patient 2	4	None	None	None	0	3
Patient 3	13	None	Venous Re-anastomosis	None	0	3.5
Patient 4	20	None	None	None	0	3
Patient 5	60	Yes	None	None	1	2.5
Patient 6	29	None	None	None	0	3
Patient 7	15	None	None	None	0	3
Patient 8	17	None	None	None	0	3.5
Patient 9	12	None	None	None	0	4
Patient 10	18	None	None	None	0	3.5
Delayed Reconstruction						
Patient 1	35	Yes	Venous Re-anastomosis	None	0	4
Patient 2	40	Yes (Amputation)	None	None	0	4
Patient 3	40	None	Artery Re-anastomosis	None	0	3.5
Patient 4	30	None	None	None	0	4.5
Patient 5	99	Yes	Venous Re-anastomosis	None	1	8
Patient 6	20	None	None	None	0	3.5
Patient 7	42	None	None	None	0	4
Patient 8	62	Yes	None	None	1	4.5
Patient 9	48	None	None	None	0	5
Patient 10	26	None	None	None	0	4
Patient 11	34	None	None	None	0	6
Patient 12	51	None	None	None	0	5
Patient 13	53	Yes	None	None	0	4
Patient 14	40	None	Venous Re-anastomosis	None	0	5

Table 3: Statistical analysis between emergency and delayed groups

	Emergency Reconstruction	Delayed Reconstruction	*P*-value
Infection	Low	High	0.03 *
Vascular Complication	Low	High	0.04 *
Length of Stay in Hospital	Low	High	0.01 *
Time of Surgery for Reconstruction (h)	Low	High	0.16
Number of Additional Debridement	Low	High	0.33

Figure 3: Patient No 5 in the ER group: A 17-year-old male patient was referred to our emergency department because of a motorcycle accident. Images of the injury in the emergency department (A, B), Pre-operative preparation for early debridement, bone fixation, and soft tissue reconstruction in the operating room (C), Peri-operative planning of 25x15 cm ALT flap for soft tissue reconstruction (D), Harvested ALT flap with single perforator (E, F), Bone fixation with plate and screws (G), Post-operative image of soft tissue reconstruction (H), Re-operation for additional debridement and removing plate and screws because of infection three weeks after the initial surgery (I), Post-operative 20 months (J).



Discussion

One of the pioneering works about reconstructive time was published by Godina [3], who showed that the best results could be obtained during the first three days after injury, and the period ranging from 3 days to 3 months yielded more flap failures. Lee et al. [6] updated Godina's paradigm and extended the safe reconstructive cut-off day to 10 days. Haykal et al. [5] reviewed 43 articles, and the meta-analysis results showed that ER produced lower flap failure rates than DR. Roubaud et al. [10] examined 51 patients with reconstruction times <15 and >15 days, found no differences, and defined the subacute period as a safe reconstruction alternative. Steiert et al. [11] examined 33 lower and 10 upper extremity defects with pedicled and free flaps and found similar results between DRs and ERs.

Our center has been performing elective lower extremity reconstructions for many years. However, operations before 2018 were not included in the study that aimed to compare the emergency reconstructions and elective surgeries performed in the same period by the same surgical team. Although 24 patients applied or were referred to our center between 2018 and 2021, most patient underwent surgery from 2018 to 2019. We think the decrease in our patient count in 2020 and 2021 may have been caused by the coronavirus 2019 (COVID-19) pandemic since the ensuing curfews led to a reduction in the number of trauma patients with dressings who returned to the hospitals for follow-ups during this period due to fear of contracting COVID-19.

Many benefits of emergency reconstruction, both for patients and the workflow of the surgical unit, can be described. The time-consuming dressing changes, which occupy the medical personnel, are avoided. Operating room schedules for routine procedures are not affected as the cases are resolved after-hours [12]. Debridement and soft tissue reconstruction are applied in the same session, so the patient does not need to receive extra anesthesia. One of the limits for emergency reconstruction is the need for serial debridement as described in the literature [7,13]. Our study shows that serial debridement is not always necessary as emphasized by Singh et al. [12]. Sharp debridement of all devitalized tissue with meticulous visualization may avoid additional debridement.

With all benefits mentioned above, emergency reconstruction of lower extremity defects must become routine rather than a rare occurrence reserved for extreme cases. Patterson et al. emphasized that it would not be easy to perform this surgical procedure routinely, even in major centers, for various reasons [8]. Several measures are necessary to establish successful round-the-clock reconstruction of these cases in our experience.

It should be kept in mind that surgery will be performed under emergency rather than elective conditions. The evaluation, especially out of hours, may not be as detailed as the elective planned surgery. Therefore, it's beneficial to perform the surgery electively in the presence of the slightest situation that will put the surgery or the patient at risk. Concomitant life-threatening injury is one of the drawbacks [11,14]. Patient must be examined meticulously, and life-threatening injuries, and chronic or/and systemic diseases must be excluded, especially in young patients who abuse drugs or substances and may not mention this situation during the pre-operative evaluation.

The number of surgical teams, experience, and operation time are essential issues to consider in emergency conditions. It should be noted that the immediate reconstructive procedure for a lower extremity injury with intact circulation is not a real emergency. Even if there is no risk for the patient to receive general anesthesia, overlooked problems may be provoked by long operative times, so the time of surgery must be short as soon as possible. Therefore, while it is evident that surgical speed is not essential in surgical outcomes, speed also gains importance, especially in nighttime emergencies, for the above-mentioned reasons. Surgical procedures that take too long will be far from sustainable for the emergency reconstructions. We have two teams, one of whom is a backup for any situation of unavailability, and each team has two surgeons. Although it may be thought that larger surgical teams will increase surgical comfort, especially in elective cases, the surgical teams need to be used efficiently in emergency situations. Teams must be composed of a minimum count of staff who can complete the procedure efficiently.

Combining bone and excessive soft tissue defects deserves a more careful approach. Georgescu et al. used latissimus dorsi or serratus anterior muscles with ribs to

successfully reconstruct bone and soft tissue defects [15]. Although there are different options for repairing tibial defects, we think that one of the most suitable donors is the fibula, according to the reconstructive principle of "like for like." In cases in which the defect is too large to be closed with the skin paddle of the fibula in a single session out of hours, we find it more appropriate to complete soft tissue reconstruction first. The use of double-free flaps for both bone and soft tissue reconstruction at the same time is not applicable due to the above-mentioned conditions mentioned during the emergency period. One of the significant advantages of staged reconstruction in this type of injury is that it transforms a complex traumatic wound into an isolated bone defect covered with vital soft tissue. When complete soft tissue healing is achieved and since the flap will be revascularized from the neighboring tissues, it can be safely incised even disregarding the pedicle (Figure 2).

Godina [3] emphasized that fibrosis extends up to 10 cm from the trauma zone and reduces circulation by pressing on the veins, thus making the veins more susceptible to damage or tears. Although the reconstructive surgical time was not statistically different between the two groups and flap harvesting times were the same in our study, dissection of the recipient vessel, preparing the vessels for anastomosis, and the anastomosis times were long and difficult because of fibrosis and tissue edema. For the same reasons, vascular thrombosis and relevant complications can be seen at high rates in the DR group. For some cases, especially in the fibrotic zone, the veins appear to be hollowed out. When the vein is cut and inspected, no thrombus is found in the lumen; thus, it resembles an empty tube disconnected from circulation. Anastomosis should not be applied to such veins even if there are no suitable veins in the adjacent region, so a vein graft should be utilized to achieve a patent vein. Hill et al. [14] examined 60 free flaps and found thrombosis to be an essential factor for reconstructions after three days. In our study, vascular complications were higher in the D group. We think that the importance of the surgical time during the emergency period has been replaced by the importance of flap follow-up in the delayed period. Having medical personnel with sufficient experience in charge of flap monitoring is particularly important in late-term reconstructions.

We excluded controlled bleeding or leech therapy from our treatment algorithm years ago, especially after venous return problems. The salvage procedure is within our routine protocol in cases in which a problem with circulation is found. The first procedure used by our group is cutting the anastomosis, washing the lumen, and if possible, performing a thrombectomy. If a thrombectomy is impossible, it is essential to excise the thrombosed part of the vessels. However, in some cases, yellowish fibrin-like residues that remain attached to the vessel wall can be seen even after thrombectomy. These micro residues can be overlooked without meticulous microscopic examination, and the open lumen of the vessel may mislead the surgeon. So, vessel excision should be performed until it is certain that the lumen is clean. We note that after excision of the thrombotic vessel part, re-anastomosis should be performed without tension, and vein grafting should be performed even in case of slight hesitation about tension. One of the emergency group and four of the delayed group patients had vascular thrombosis. All flaps were salvaged after early exploration and vein graft application.

Most of the injuries that require free flaps are adjacent to the tibia. We consider it an essential advantage that the anterior tibial artery (ATA) is easy to access due to its proximity to the tibia, so it is the most frequently used as the recipient artery in our experience. For the same reason, ATA is known as the vascular structure most vulnerable to injury when compared with the peroneal or posterior tibial system in the literature [16]. Despite its frequent injury due to trauma and doubts about its choice as a recipient vessel by many surgeons, studies show that ATA can be used safely [17,18]. Our approach is to use it as the first choice. In cases in which the ATA is damaged, we prefer to anastomose to the appropriate segment by moving proximally. So, the structure of peroneal or posterior tibial vessels is preserved by using ATA as a recipient vessel whose contribution to the distal circulation has already been lost. However, especially in terms of middle lower extremity reconstructions, the effort to anastomose in a clean area by leaving the trauma zone requires passing a bulky anterior tibial muscle and reaching the deeply located ATA. Although various retractors used for this purpose provide direct access to the ATA during anastomosis, repositioning the thick anterior tibial muscle after the removal of the retractor can cause a loss of the length and pressure on the pedicle. Thus, it should be calculated in detail how far from the trauma zone an anastomosis will be done and how much pedicle length loss will occur due to deeply located recipient vessels, especially for mid-tibial region reconstructions.

Particular attention should be paid to the circulation in the extremities of patients whose initial condition is unknown and who are referred by an external center in the delayed period. Colen et al. [19] emphasized the benefits of CTA, and many centers use it to evaluate circulation or recipient vessels of the lower extremity. However, angiographic evaluation alone can be misleading due to artifacts in patients who underwent previous bone fixation. We find it important that even if no circulatory problem is detected angiographically or the presence of patent distal pulsations exists, the recipient vessels should be clamped peri-operatively for a while to confirm that no circulation problem in the distal part is present.

Although the efficacy of antithrombotic agents is controversial in terms of flap survival, we believe that the use of antithrombotic agents during late reconstruction is particularly beneficial. Lee et al. [20] examined 4984 cases in 12 articles, and their meta-analyses showed that the use of antithrombotic agents had no statistically different effect on flap survival. We believe that, rather than significantly impacting flap survival, anti-thrombotic agents buy the surgeon time for salvage surgery as these agents slow the settling of thrombosis into the vascular network.

In our opinion, when reconstructive microsurgeons encounter such patients whether in the emergency or delayed period, they should perform the reconstruction without waiting for the end or start of any period. Each period has unique and specific problems that need to be addressed. With the advances in microsurgery, reconstruction can be performed successfully either during the emergency or delayed period. At this point, we believe the main discussion should focus on unique challenges

and their solutions during different periods rather than choosing between them.

Conclusion

Emergency reconstruction has many advantages, such as preventing time-consuming procedures and providing short hospital stays and low complication rates. However, DR is inevitable for some reasons and despite its more complicated nature, meticulous flap follow-up and salvage procedures may provide the same flap success as found with emergency reconstructions.

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