Assisted Healing–Selective Delayed Reconstruction for Subacute Traumatic Wounds of the Lower Limb

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BACKGROUND

Patients often are being referred to plastic surgery for reconstruction of complex wounds in the subacute phase of healing. According to Godina,[1] the time interval for the acute reconstruction (early free flaps) is less than 72 hours.[2] Byrd et al,[3] however, believe that the acute period of the wound lasts 1 week. Only after that, the wound enters in the subacute phase in which treatment of complex wounds becomes more prone to complications (bone and soft-tissue infection, free flap failure).

METHODS

We manage the subacute wounds conservatively with assisted healing and selective delayed reconstruction. A radical debridement in this phase could lead to a greater tissue and function loss. After an initial assessment, the wound healing is "assisted" by combining wound bed preparation and the treatment of comorbidities. In the former, we try to achieve selective removal of the necrotic tissue with hydrosurgery and/or the use of piezoelectric scalpels and provide optimal dressing care and/or, when indicated, negative pressure wound therapy. In the latter, we provide the patient with potential for healing through revascularization, glycemic control, targeted antibiotic therapy, offloading, and compression therapy.

During the wound bed preparation phase, a selective delayed reconstruction is planned by the most adequate technique or a combination of 2 or more techniques: skin grafts, dermal substitutes, and flaps.

RESULTS

Since 2007, we have treated 18 patients (9 males and 9 females) with complex subacute trauma of the lower limb, with an average age of 44.3 years (range, 16–87; Table 1). Thirteen patients (72%) had a fracture. Of those, 1 had a Gustilo II, 4 patients had Gustilo IIIA, and 8 Gustilo IIIB (1 of those was initially a Gustilo I but later became IIIB due to nonalignment).[4,5] The soft-tissue defect ranged from 28 to 750 cm² (mean, 152.2) and was classified as pattern 1 in 8 patients, as pattern 2 in 9 cases, and as pattern 4 in 1 case according to the Arnež et al[6,7] soft-tissue degloving classification. In 11 patients, we used negative pressure wound therapy (61%). For 14 patients, the antibiotic therapy was supervised by our infectious disease department, whereas the other 4 patients only got antibiotic prophylaxis as per our institution's guidelines. The number of operations ranged from 2 to 5 (mean, 3.3); most of them were debridements (range, 1–4; mean, 2.45) with a mean hospitaliza-

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Table 1. Patients Treated in the Subacute Phase: Wound Characteristics, Operations, Hospitalization, and Follow-up

Case	Sex	Age	Trauma	Polytrauma	Fracture	Degloving	Operations	Hospitalization (d)	Follow-up (mo)
1	M	16	Road traffic injury	Yes	IIIB	1	4	47	96
2	M	28	Road traffic injury	No	IIIB	1	3	61	36
3	F	21	Road traffic injury	Yes	—	1	3	39	18
4	F	80	Road traffic injury	No	IIIA	1	3	74	3
5	M	56	Crush	No	IIIA	2	3	49	80
6	M	48	Road traffic injury	Yes	IIIA	2	4	30	76
7	F	76	Road traffic injury	No	IIIA	1	2	33	12
8	F	22	Road traffic injury	Yes	—	1	4	9	16
9	M	22	Road traffic injury	No	IIIB	2	4	20	1
10	M	39	Road traffic injury	No	—	2	2	15	1
11	M	16	Road traffic injury	Yes	IIIB	2	3	61	57
12	F	64	Fall	Yes	II	2	3	161	34
13	F	29	Road traffic injury	No	—	2	5	53	44
14	M	55	Road traffic injury	Yes	IIIA	1	2	31	3
15	F	76	Road traffic injury	No	—	2	3	59	30
16	F	37	Road traffic injury	No	IIIB	2	4	47	18
17	F	87	Road traffic injury	No	I → IIIB	1	4	41	1
18	M	25	Road traffic injury	No	IIIB	4	3	61	3

F indicates female; M, male.

Table 2. Patients Treated in the Subacute Phase: Wound Size, Treatments and Complications

Case	Size (cm²)	Debridements	Antibiotic Therapy	NPWT	Reconstruction	Complications
1	750	2	Yes	No	ALT + DS + SG	Osteomyelitis
2	150	2	Yes	No	ALT	No
3	100	2	Prophylaxis	Yes	DS + SG	No
4	300	2	Yes	Yes	SG	No
5	200	3	Yes	Yes	SG	No
6	100 + 30	3	Yes	No	SG	Pseudoarthrosis
7	150	1	Prophylaxis	No	SG	No
8	80 + 8	3	Yes	No	DS + SG	No
9	36	2	Prophylaxis	No	SG	No
10	250	2	Yes	Yes, Instill	SG	No
11	100	3	Yes	Yes, Instill	ALT + nerve graft	No
12	40	3	Yes	Yes	SG	No
13	75	3	Yes	Yes	SCIP + DS + SG	Venous thrombosis
14	72 + 8 + 8	2	Yes	No	SG	No
15	200	3	Yes	Yes	SG	No
16	40	4	Prophylaxis	Yes	Ulnar flap + palmaris longus + DS + SG	No
17	28	2	Yes	Yes	Local fasciocutaneous flap	No
18	50	2	Yes	Yes	ALT	No

ALT, anterolateral thigh flap; DS indicates dermal substitute; SCIP, superficial circumflex iliac artery perforator flap; SG, skin graft.

tion of 49.5 (range, 9–161) days. The reconstruction was performed with a skin graft in 9 patients, with dermal substitutes and later with skin grafts in 2 patients, with a local flap in 1 patient, and with free flaps in 6 patients (of those 3 combined with dermal substitute and skin graft).

We had 3 complications: a venous thrombosis in a free flap that was revised with flap salvage, 1 osteomyelitis treated by antibiotics, and a tibial pseudoarthrosis that was treated by our orthopedics by intramedullary nailing (Table 2).

CONCLUSIONS

In our experience, treatment of subacute wounds with assisted healing and selective delayed reconstruction achieved good results with low osteomyelitis rates (5.6%) by giving priority to ensuring preoperative infection control, by providing the

wound with a healing potential, and by using smaller flaps compared with radical debridement—early free flap approach.

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