Intra-Wound Injection of Platelet-Rich Plasma in Addition to Vacuum-Assisted Closure for Non-Healing Wounds in Patients with Diabetes Mellitus

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To the Editor:

WE READ WITH INTEREST the comparative study by Günel et al. [1] on the efficacy of vacuum-assisted closure (VAC) and GranuFoam Silver® dressing (KCI, San Antonio, TX) for the treatment of diabetic foot ulcers. Their results suggest that this therapy is useful in reducing the recurrence rate of infected diabetic foot ulcers.

Vacuum-assisted closure has been used in the clinical treatment of extensive and complex wounds for almost two decades [2]. It is well documented that VAC accelerates wound healing by improving angiogenesis and granulation tissue formation and decreasing bacterial load [3]. Nevertheless, it is not uncommon that clinically some chronic wounds show no progress of regeneration even after long-

term VAC intervention, especially in the presence of diabetes mellitus (DM), therefore necessitating adjunctive treatments.

Recent evidence has proved that intra-wound administration of platelet-rich plasma (PRP) could accelerate regeneration effectively [4]. Between September 2011 and September 2014, we treated 11 patients with diabetes mellitus (11 wounds) successfully using combined VAC-PRP therapy. All had been diagnosed with non-healing wounds based on no obvious granulation tissue on the fifteenth day after primary VAC dressing. Their mean age was 61.8 ± 8.5 y, and the mean size of the wound was 26.1 ± 3.9 cm².

Adjunctive PRP therapy was administrated intra-wound at the start of secondary VAC treatment as follows. Platelet-rich plasma was prepared by centrifugation of autologous whole blood at 1,200g for 5 min and removal of leukocytes,

TABLE 1. DEMOGRAPHIC CHARACTERISTICS AND CLINICAL OUTCOMES OF STUDIED PATIENTS

Case	Age	Gender	BMI (kg/m ²)	Major co-morbidity	Size of wound before VAC-PRP (cm × cm)	Location of wound	Length of VAC-PRP (days)	Size of wound after VAC-PRP (cm × cm)	Revision surgery after VAC-PRP	Hospital stay (days)	Wound healing at discharge
1	60.0	F	17.21	Hypertension	4.1 × 6.6	Buttock	33	1.0 × 2.5	Suture	42	Yes
2	59.7	M	32.8	COPD	5.0 × 4.4	Foot	45	1.3 × 2.4	Suture	55	Yes
3	73.0	M	27.4	Hypertension, COPD	4.1 × 7.0	Buttock	36	2.0 × 3.1	Local flap transfer	45	Yes
4	66.8	M	23.4	—	3.5 × 8.0	Back	42	1.8 × 2.6	Suture	54	Yes
5	70.1	M	27.9	COPD	6.3 × 4.7	Foot	33	2.4 × 2.2	Local flap transfer	42	Yes
6	55.4	M	27.6	COPD	5.2 × 5.0	Foot	48	2.3 × 1.1	Split-thickness skin graft	60	Yes
7	62.0	M	25.6	Dyslipidemia	3.3 × 6.9	Foot	39	1.0 × 2.5	Suture	50	Yes
8	63.5	M	30.2	Hypertension	6.9 × 4.3	Buttock	42	2.4 × 2.2	Local flap transfer	51	Yes
9	49.5	F	25.9	—	4.9 × 5.7	Back	36	1.4 × 0.9	Suture	45	Yes
10	47.9	M	25.9	—	5.7 × 5.1	Foot	33	1.0 × 0.3	Split-thickness skin graft	43	Yes
11	72.4	M	19.8	Hypertension	5.3 × 3.2	Buttock	45	0.9 × 0.8	Suture	55	Yes

BMI=body mass index; COPD=chronic obstructive pulmonary disease; VAC=vacuum-assisted closure; PRP=platelet-rich plasma; —=no comorbidity or complication;

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erythrocytes, and residual substances. Subsequently, PRP was activated with 10% calcium citrate and injected 0.05 mL/point/cm² into the prepared wound using 30-gauge needles. As the final step, VAC dressings were applied, sealed, and connected to pumps. Additionally, the Medical Outcomes Study Short Form 36-Item Health Survey (SF-36) was used to access the quality of life of patients before and after VAC-PRP therapy.

The mean length of VAC-PRP therapy was 39.3 ± 5.4 d. After the combined wound therapy, relatively fresh, adequate granulation tissues were observed in all patients. No complications were recorded. The average size of wounds decreased to 3.1 ± 1.9 cm² ($p < 0.01$). All 11 patients received revision surgeries after VAC-PRP therapy, including direct suture, split-thickness skin grafting, and local flap transfer. No complications were recorded. The mean hospital stay was 49.3 ± 6.2 d. All wounds were completely healed at discharge. More information is provided in Table 1. In the physical as well as the mental summary of SF-36, there were greater values after VAC-PRP therapy (52.5 ± 13.7 versus 54.0 ± 20.2 and 49.7 ± 15.0 versus 51.1 ± 19.3, respectively), however, no significant difference was identified ($p \geq 0.05$).

It has been agreed that PRP contains various secretion proteins, such as platelet-derived growth factors, transforming growth factors- β , and platelet-derived angiogenesis factor, etc., and evidence has shown that better wound healing rates could be achieved by PRP therapy [5]. Previously there were few reports on the combination of PRP and VAC, because in the classic method the plasma is sprayed directly onto the wound and could be drained away by negative pressure. We believe that the combination of intra-wound PRP injection and VAC dressing could confer all benefits of both treatments and achieve satisfactory results in the treatment of non-healing diabetic wounds.

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