Case Report

A Case of Extensive Necrotizing Fasciitis with Poor General Condition Treated by Gradual Debridement and Postage Stamp Skin Graft Bolstered with Negative Pressure Wound Therapy at the Bedside

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ABSTRACT

Based on untreated diabetes, a 69-year-old female patient was hospitalized for necrotizing fasciitis of the right thigh from the lower abdomen. After recovering from shock by antibiotic administration and general care, treatment of the remained ulcer was planned; however, it was judged that treatment with general anesthesia was difficult. Therefore, four gradual postage stamp skin grafts were performed at the bedside in combination with local anesthesia and negative pressure wound therapy. The skin grafts were taken completely, and no notable problems were found after the procedure. Gradual postage stamp skin graft bolstered with negative pressure wound therapy has the advantages of minimal invasion, high rate of graft take, and does not interfere with the main treatment. Although it has some cosmetic disadvantages, it is a useful method, especially for poor general conditions.

Key words: minimally invasive surgery, patch graft, skin graft fixation

Introduction

The treatment of widespread skin defects in patients with poor general conditions is difficult in plastic and reconstructive surgery. Immediate wound closure is desirable because malnutrition progresses owing to exudation from skin ulcers. However, the risk of general anesthesia is also high in such patients, often making one-stage skin grafting difficult. Postage stamp skin grafting is a minimally invasive procedure that can be performed with local anesthesia at the bedside and may treat skin ulcers in patients with poor general condition. However, in such patients, bacteria often colonize on the ulcer surface, and it is not uncommon for skin grafts to be lost due to infection. In addition, widespread skin defects tend to cause the dressing to slip, leading to a poor take rate of the postage stamp skin graft. The graft must be in close contact with the wound bed for skin grafting, and various fixing methods are used. The tie-over technique or bandage technique has been standard conventionally, but the fixation with negative pressure wound therapy (NPWT) has become widely used in recent years. Compared to the conventional method, it is an excellent method in terms of rate of graft take, complications such as wound infection, and cost. Here, we report the safe and favorable results of gradual postage stamp skin graft bolstered with NPWT for extensive skin defects in patients with poor general condition.

Case presentation

69-year-old female. Based on untreated diabetes, she was hospitalized for necrotizing fasciitis of the right thigh from the lower abdomen (Fig. 1a). She was in shock due to sepsis, but antibiotics improved her inflammation, and she withdrew from the shock. Subsequently, debridement was performed. However, since she had a cerebral infarction when shock and treatment under general anesthesia were at high risk, bedside debridement was performed daily under local anesthesia (Fig. 1b). Eight days after the start of debridement, most of the necrotic tissue was resected. Still, extensive skin defect of 35 ×
37.5 cm remained, and NPWT with the V.A.C.® system (3M/KCI, St. Paul, Minnesota, United States) was started. In addition, basic fibroblast growth factor (bFGF) was used for foam replacement (Fig. 2). Since good granulation was formed 13 days after the start of NPWT, skin graft closure was considered. Treatment under general anesthesia was still at high risk; therefore, a gradual postage stamp skin graft was planned. In the range of epinephrine-added 1% lidocaine 10–20 mL at a time, a split-thickness skin graft was harvested from the left thigh using a razor and transplanted to the ulcer. Without using non-adhesive dressings such as silicone gauze, the foam was placed directly and fixed with a continuous negative pressure of -125 mmHg. No suture fixation was performed on the skin graft pieces. The foam was exchanged 3 days after grafting, and skin grafts were added using the same method each time. bFGF was used each time. Skin grafts were performed a total of four times (day13, 16, 19, and 22) (Fig. 3). NPWT was continued 28 days (6 days after the fourth grafting).

Skin grafts were all taken, but no epithelialization of the gaps between the skin grafts was observed during negative pressure fixation. When the distance between the skin grafts was less than 2 cm, the treatment was switched to ointment.
The ulcer was epithelialized 3 weeks after NPWT was completed, and no particular problem was observed (Fig. 4).

**Discussion**

Blackburn et al. reported NPWT as skin graft fixation in 1998, and many experiences have been reported since then. Recently, there have been some reviews comparing with the conventional method and the negative pressure fixation. Yin et al. reported that the negative pressure fixation group had an average of 7.02% better rate of graft take than the conventional method, and there are other similar reports. The following causes are considered as factors for improving skin graft engraftment. That is, negative pressure fixation makes it easier to adhere to an irregular lower bed, reduces the occurrence of hematoma and seroma, maintains a moist environment for initial skin graft engraftment, improves edema, creates a good wound bed, and reduce the risk of slippage and infection.

However, although it is a Japanese paper, the opposite result has also been reported. Kuroda et al. reported a retrospective study showing that the conventional method group had a better rate of graft take than the negative pressure fixation group. Further case accumulation is required.

Postage stamp skin grafting is a method that has been used for a long time, and it is used for extensive burns because it can cover a large area with a small amount of skin graft, although it is inferior in terms of cosmetic appearance. There are not many reports mentioning this method, either because the donor site of the skin is mostly epithelialized, but some erosions remain.

**Fig. 3.** Gradual postage stamp skin graft.
A: 3 days after the first skin graft, when the first form is replaced. All skin grafts are taken and do not fall off during replacement.
B: At the time of foam exchange, 3 days after the second skin grafting.
C: Three days after the 4th skin graft. At this time, gradual skin grafting was performed.

**Fig. 4.** 3 months after the final skin grafting.
Completely epithelialized with no relapse of inflammation. The donor site of the skin is mostly epithelialized, but some erosions remain.
method is too basic or harder to suture and fix than mesh skin grafts. Therefore, there are even fewer reports focusing on negative pressure fixation on postage stamp skin grafts. It was not possible to confirm the rate of graft use compared with the conventional method\(^1\). However, compared to other skin grafting methods, it can be performed with minimal invasiveness and minimal equipment, so it is a very good method for patients who have difficulty moving or are in poor general condition.

Consider the method. In our case, skin grafts of approximately 25 cm\(^2\) were collected from a range of approximately 3 × 10 cm with 10 mL of epinephrine-added 1% lidocaine. Since the maximum amount of epinephrine-added 1% lidocaine is 7 mL per 10 kg of body weight, the amount that can be safely used at one time is often about 20-30 mL for adults with poor general condition. Although the dose can be increased with tumescence, excessive fluid administration is often a risk in patients with poor general condition\(^1\). Therefore, local anesthesia should be used up to approximately double dilution, skin grafts of approximately 25-100 cm\(^2\) will be performed at one time.

Consider the conditions for negative pressure and the period of use. In addition, we often perform closure using this method for refractory ulcers. After the ulcer has been cleared, NPWT is performed to improve the condition of the wound bed. When granulation on the wound bed was good, skin grafting was performed. In most cases, the negative pressure was -125 mmHg, which was persistent. This continues the preoperative wound bed preparation condition, but it seems that some studies may use a slightly weaker negative pressure. The skin grafts were not sutured or fixed. In addition, non-adhesive sheets, such as silicon gauze, were not used. This is because there is a concern that slippage or infection in the dressing may occur due to poor drainage. Normally, the foam is removed once in about 3 days, but the skin graft is firmly attached to the lower floor if the skin graft is taken. Therefore, the skin graft cannot be removed by replacing the foam without any special measures. However, when negative pressure fixation was completed in 3 days, granulation swelled, exudate contained pus, and part of the skin graft was shed. Therefore, negative pressure fixation of skin grafts continues for at least 5-6 days. This is thought to be because the skin graft is vulnerable to infection until the new blood vessels enter the skin graft.

Due to the advantages of less invasiveness and the simplicity of the procedure, closure by this method is a good indication for patients who are in good general condition but are less than 50 cm\(^2\) and do not require a cosmetic appearance. We performed the same method for the detached wounds of the anterolateral thigh flap and the fibula flap donor site after head and neck reconstruction. In addition to the cases described in this report, the same treatment was performed in 11 cases at present, and 10 cases were completely treated, and 1 was partially taken (Fig. 5). After head and neck reconstruction, it is useful that it can be completed at the bedside without interfering with post-treatment for the tumor.

The advantages of this method are as follows. Because the invasion is small, it can be easily performed even for patients in poor condition. It can be performed in an additional time of about 5 min in daily form exchange, and it is a simple method that does not require special tools other than a razor. Because it can be performed at the bedside, it does not require manpower for patient transfer. It is easier to fix than conventional postage-stamp skin grafts. In addition, the donor site often becomes

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**Fig. 5.** Postage stamp skin graft bolstered with negative pressure wound therapy for donor site of flap elevation.

Hemilateral tongue resection was performed for tongue cancer, and reconstruction with the anterolateral thigh flap was performed, but the donor site wound was dissected. Postage stamp skin graft bolstered with negative pressure wound therapy was performed at the bedside in parallel with post-treatment for the tumor.
intractable when planar skin harvesting using the dermatome is performed in patients in poor condition. When harvesting the skin with a razor, it may be an advantage that the wound is not intractable because the wound after harvesting the skin is scattered.

Gradual postage stamp skin graft bolstered with NPWT is a safe and simple method. Still, it is important to accumulate the number of cases and determine better conditions.

**Conclusion**

We report a case of extensive necrotizing fasciitis with poor general condition treated with gradual debridement and postage stamp skin graft bolstered with NPWT at the bedside. It was confirmed that this method is useful, especially in patients with poor general condition.

**Conflicts of interest**

Authors declare that they have no conflicts of interest.

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