

## Reconstruction Using Negative Pressure Wound Therapy with a Cotton Filler for Fixation of Male Genital Skin Grafts in Cases of Fournier's Gangrene

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The reliable engraftment of skin grafts into areas with complex shapes can be challenging. Here, we report a case of successful fixation of a genital skin graft using negative pressure wound therapy (NPWT) with RENASYS<sup>®</sup> Cotton Filler. A 44-year-old male with no relevant medical history underwent split-thickness skin grafting for a genital skin defect caused by Fournier's gangrene. A 0.4-mm sheet graft was applied for the penile skin defect, while 0.4-mm 1.5 times mesh grafting was applied for the testis and spermatic cord. NPWT with a cotton filler was used for seven days of fixation. No postoperative pain or stool contamination was observed. Although a small area of partial necrosis developed, the lesion healed with conservative treatment. Six months after surgery, there was no scar contracture, urination disorder, or pain during erection. Cotton fillers are highly malleable and adaptable, allowing for simple and reliable fixation of skin grafts in complex areas. Moreover, NPWT for genital graft fixation avoids contamination from stools. Therefore, we recommend fixation using NPWT with a cotton filler for genital skin grafting. (*J Nippon Med Sch* 2024; 91: 595–599)

**Key words:** cotton filler, gauze based, negative pressure wound therapy, skin graft, genitalia

### Introduction

The fixation of skin grafts with complex shapes or in areas prone to contamination can be challenging. While the conventional tie-over method is typically employed, negative pressure wound therapy (NPWT) is also used for graft fixation. In Japan, NPWT for this purpose is not covered by insurance, but it is frequently used in clinical practice, and some reports suggest a superior graft take rate over the conventional tie-over method<sup>1,2</sup>. Instead of the polyurethane foam typically used for compression fixation of skin grafts, a cotton filler is another option (**Fig. 1**). In this study, we report the successful use of RENASYS<sup>®</sup> Cotton Filler (cotton filler) for compression fixation in the genital area.

### Case Presentation

The patient was a 44-year-old male with no significant medical history or current medications. He presented

with Fournier's gangrene, which originated from an ulcer on the glans. Two sessions of debridement surgery were performed, followed by daily wound cleansing. After wound bed preparation, reconstruction was carried out through split-thickness skin grafting to address the circumferential skin defect of the penis and the skin defects of the testis and spermatic cord. The ulcer was debrided with a sharp spoon curette, and the testes were sutured together with 4-0 polyglactin (**Fig. 2**). Split-thickness skin grafts were harvested from both thighs with an electric dermatome set at 0.4 mm. A 0.4-mm sheet graft was applied for the penile skin defect. In comparison, 0.4-mm 1.5 times mesh grafting was applied for the testis and spermatic cord (**Fig. 3**). The penis and scrotum were each wrapped three times with a cotton filler, filled to form a dome shape and sealed with film on the dorsal and ventral sides before fixation with NPWT (**Fig. 4**). Due to minor leakage, the negative pressure was set at 140 mmHg

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Fig. 1 RENASYS® Cotton Filler  
Gauze-based filler for negative pressure wound therapy.

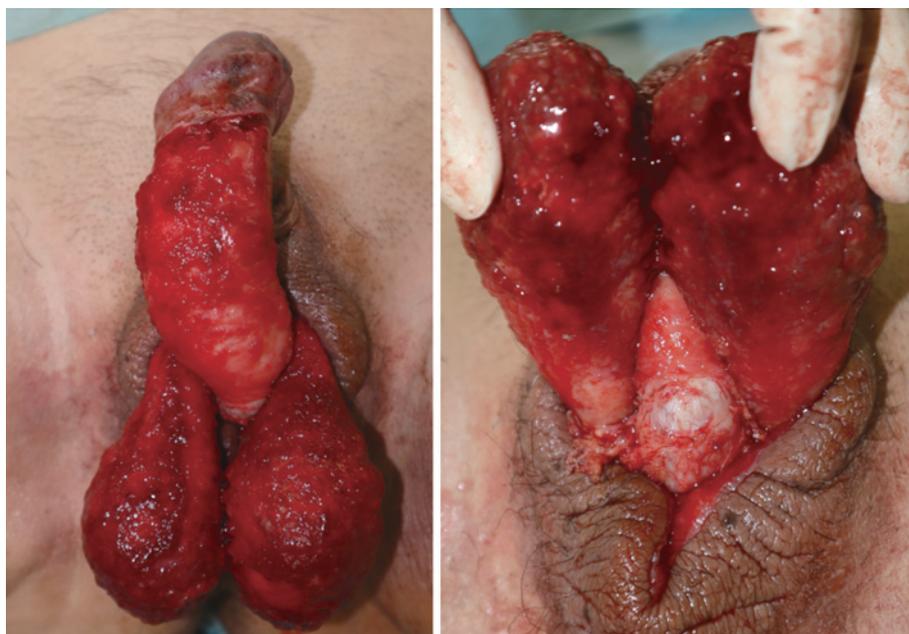


Fig. 2 Pre-grafting  
The wound was debrided, and the testes were sutured together.

based on the hardness of the filler and the color of the penile tip.

### Case Findings

The postoperative course was painless and uneventful, and the patient could walk and have bowel movements twice daily without contamination. The fixation was removed on the seventh postoperative day. At that time, we observed 5% full-thickness graft necrosis on the distal dorsal side of the penis, superficial necrosis in other areas, and complete engraftment on the testicles and spermatic cord (Fig. 5). The superficially necrotic area healed promptly, while the partially necrotic area healed with conservative treatment. Eleven months after surgery, the wound was in good condition with no signs of scar con-

tracture, urinary dysfunction, or pain during erection (Fig. 6). Ultimately, the patient was able to engage in sexual intercourse using a condom.

Informed consent was obtained from the patient for publication of this case report and accompanying images.

### Discussion

There are challenges in genital skin grafting, such as the complex and three-dimensional shape of the genitalia and the high risk of infection due to fecal contamination. Furthermore, the graft may become dislodged owing to changes in the size of the penis or movements of the adjacent hip joint, leading to a decrease in the graft take rate. Effective fixation methods are required to address these issues and prevent scar contracture after healing.

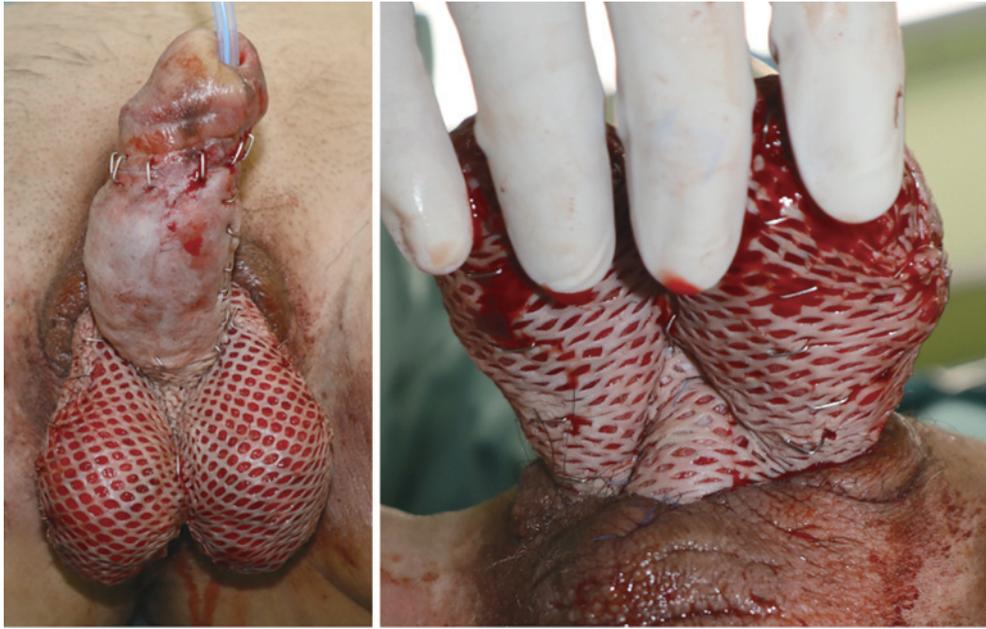


Fig. 3 Grafting on the testis and spermatic cord  
 A 0.4-mm sheet graft was applied to the penis.  
 A 0.4-mm 1.5 times mesh graft was applied to the testis and spermatic cord.



Fig. 4 Fixation of the graft using a cotton filler  
 The graft was wrapped three times with a cotton filler and then filled to form a dome.

Conventional tie-over methods are commonly used for skin graft fixation. Even in the case of genital grafts, it is possible to achieve favorable results with this method<sup>3,4</sup>. However, without a skilled surgeon, using the tie-over technique on three-dimensional areas like the genitals risks extending the surgical duration and reducing the graft take rate due to the difficulty of ensuring uniform pressure.

Recently, the usefulness of NPWT in skin graft fixation has been reported<sup>5</sup>. A meta-analysis comparing NPWT and the conventional tie-over method was conducted by

Jiang et al.<sup>2</sup> in 2021, which included 488 cases of skin graft fixation. The results showed that the NPWT group had a 6.1% higher graft take rate, a 3.35-day decrease in hospital stay, and a lower reoperation rate<sup>2</sup>. Thanks to these results, NPWT is gaining attention as an effective skin graft fixation method, and reports have indicated that NPWT for skin graft fixation is effective even in the genital area<sup>6,7</sup>. Lee et al.<sup>8</sup> reported that with NPWT for skin graft fixation in the perineal area, uniform compression is possible even in complex shapes, and that sealing with a waterproof film prevents wound contamination, reducing the risk of infection and preventing displacement due to hip movement. In cases of Fournier's gangrene, colostomies are sometimes performed to prevent fecal contamination of the wound<sup>9</sup>. More non-invasive methods, such as the use of intra-rectal catheters like Flexi-Seal, may also be employed<sup>10,11</sup>. However, as in our case, where there is space to apply a film between the wound and the anus, the use of NPWT can prevent fecal contamination. However, until surgeons become accustomed to the application, they may face difficulties in properly placing the foam and addressing such issues as leakage.

Innovations in the fixation of genital skin grafts have been made, such as using hand-made gauze-based NPWT<sup>12</sup>, making slits in the polyurethane foam to simplify fixation<sup>13</sup>, and devising ways to wrap the film in order to reduce leakage<sup>14</sup>. In our case, we were unable to



Fig. 5 POD 7, removal of the dressing  
5% full-thickness graft necrosis on the distal dorsal side of the penis and complete engraftment on the testicles and spermatic cord.



Fig. 6 POM 11  
No signs of scar contracture, urinary dysfunction, or pain during erection.

control a small amount of leakage from the area where the urinary catheter was wrapped, although this did not lead to contamination. Had we used such applications as a RENASYS<sup>®</sup> gel patch or Brava<sup>®</sup> Strip Paste to enhance adhesion, we might have been able to control the leakage.

Cotton filler, a gauze material, is now available for the fixation of skin grafts using NPWT, although polyurethane foam is most commonly used. The usefulness of cotton filler in skin graft fixation was first reported in 2011<sup>15</sup>, and since then, a small number of reports on its efficacy in skin graft fixation on the limbs have been published<sup>16-18</sup>.

Compared to conventional polyurethane foam, the cot-

ton filler used in skin graft fixation with NPWT has the following advantages: 1. it is thin, flexible, and has high shape adaptability and shape memory, allowing easy and quick fixation even in complex anatomical sites; 2. it exhibits excellent water absorption, making it suitable for exudate drainage; and 3. as it does not promote internal tissue growth, it has the potential to reduce pain and prevent unforeseen tissue damage during dressing changes<sup>19</sup>. Because of these advantages, using a cotton filler with NPWT for skin graft fixation could potentially enable consistent surgical outcomes for all, reduce operative time, improve graft take rate, and shorten treatment duration.

While recent studies and clinical trials increasingly

suggest the efficacy of NPWT for graft fixation, it is important to note that in Japan, the use of NPWT for this purpose is not covered by insurance. Therefore, obtaining informed consent and approval from an ethics committee is necessary.

### Conclusion

NPWT with cotton filler for skin graft fixation in complex-shaped and potentially contaminated areas such as the genitalia may allow any operator to use relatively simple techniques to enable uniform compression, prevent contamination, and potentially achieve shorter operation times and stable engraftment rates.

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**Conflict of Interest:** None.

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