

## Case Report

# Case report: a multidisciplinary approach to maintenance of a peripherally inserted central catheter in a patient with extensive exfoliative dermatitis

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**Abstract:** Here we report a case of a patient with lymphoma and extensive skin exfoliative dermatitis, which developed after the initiation of chemotherapy. The exfoliative dermatitis resulted in extensive skin avulsion while the patient had an indwelling peripheral venous catheter (peripherally inserted central catheter, PICC). Through the effort of a multidisciplinary team, we successfully maintained the PICC using a regimen that may be applicable in burn patients. The symptoms of exfoliative dermatitis were resolved at the 3-month follow-up evaluation.

**Keywords:** Multidisciplinary, exfoliative dermatitis, peripheral catheterization, infection, nursing

### Introduction

Exfoliative dermatitis is an extreme state of skin irritation resulting in extensive erythema and/or scaling of the body. Several factors—such as pre-existing dermatosis, drug-induced reaction, malignancy—may be responsible for this skin disorder. It can be triggered by a variety of events, including infections, drug ingestion, topical application of medication, sun/ultraviolet light exposure [1]. Exfoliative dermatitis can sometimes prove fatal, especially in elderly patients. Secondary infection, dehydration, electrolyte imbalance, temperature dysregulation, and high-output cardiac failure are potential complications [2, 3]. The reported death rate varies from 18 to 64%, [1, 4-7] however, this rate has been reduced due to advances in diagnosis and therapy.

Peripherally inserted central catheters (PICCs) have been widely used in clinics, especially in patients undergoing chemotherapy who need long-term venous access. The placement of a PICC line is a simple and safe procedure. It carries a low risk of bleeding and helps reduce pain caused by repeated venipuncture, peripheral phlebitis, and drug exudation [8]. However, the maintenance of PICC can be challenging,

especially in patients with extensive exfoliative dermatitis.

In this case, a patient with lymphoma developed severe exfoliative dermatitis after chemotherapy. Extensive skin avulsion was observed near the PICC site while the patient was in critical condition. The catheter was successfully retained without infection, slippage, or other complications, through the effort of multidisciplinary collaboration.

### Case presentation

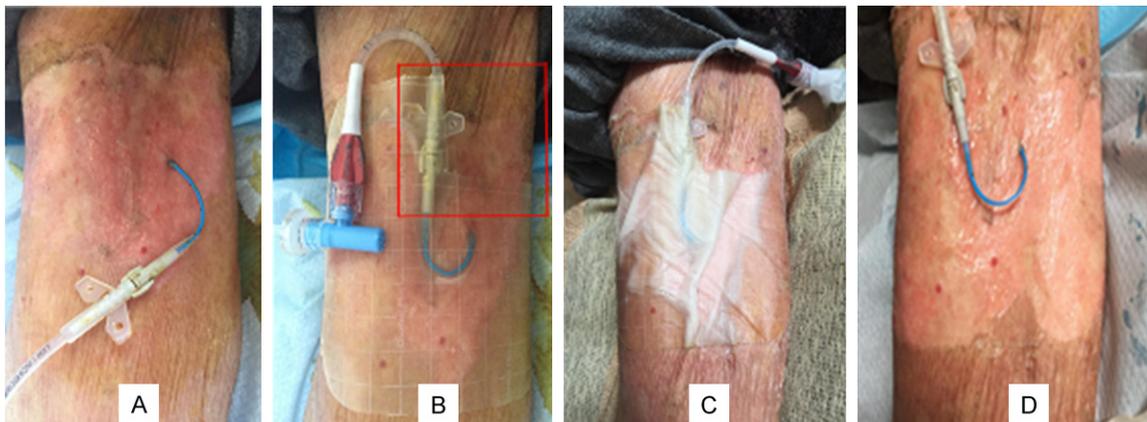
#### *Patient characteristics*

A 70-year old male patient presented with cervical lymphadenopathy at our hospital. Stage IV mantle cell lymphoma was diagnosed based on a bone marrow biopsy. A PICC line was placed in the right brachial vein, with the catheter tip behind the seventh rib, under the guidance of ultrasound by a professionally trained technician using Se Dingge technology. Chemotherapy with R-COP (Rituximab 400 mg d0 + CTX 0.6 g d1 + VDS 3 mg d1 + DXM 10 mg d1-5). Long-term hormone therapy was initiated, in combination with prednisone that was gradually reduced to 15 mg/d. After chemotherapy, the lymph nodes sizes initially decreased, but soon

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**Figure 1.** Physical examination of the patient shows measles like rashes, erythematous (highlighted in red rectangular) to dusky colored, scaly patches on the whole body (A). Patient also had edema and erosion of the lip mucosa and sore throat (B) and PICC applicator was fixed and immobile at its entrance to the skin (C). A multidisciplinary team was consulted (D).



**Figure 2.** The removal of the adhesive part of the hydrocolloid dressings caused epidermal avulsion (A). We modified the traditional approach by cutting a small piece from the upper right corner of the dressing pad and placing it under the catheter body, to avoid direct contact with the wound. We also replaced the missing part of the dressing with gauze for comparison (B). The next day we found that the hydrocolloid dressing absorbed the exudate from the wound and completely detached from the wound, which imposed significant risk to the catheter fixation. The wound under the gauze bandage was dry and hard, not suitable for epidermal growth (C), and the removal of the adhesive part caused epidermal avulsion (D).

thereafter increased. Twenty-two days later, lenalidomide (5 mg/d, by mouth) was administered to control the primary disease. After this dose was increased to 10 mg/d, lymph node sizes decreased again. Fifty-seven days later, the patient presented with symptoms including, a cough productive of phlegm, chest tightness, shortness of breath, and temperature fluctuations around 38°C. A pulmonary CT was consistent with lung infection and the patient was admitted to the hospital due to “mantle cell lymphoma with lung infection”. Symptoms were relieved after antibiotic treatment. Fifteen days after re-admission, a rash appeared on

the left lower limb, without itching. The rash was measles-like (about 0.5-1 cm diameter) with large areas of leaf-like skin exfoliation accompanied by exudation (**Figure 1A**). Twenty-four hours later, the rash had spread to the whole body and the patient developed hypoproteinemia (human serum albumin count at 26.2 g/L). The patient also had edema and erosion of the lip mucosa and sore throat, with difficulty eating (**Figure 1B**). The patient had severe lymphoma of long duration, complicated by a pulmonary infection, exfoliative dermatitis, and immune compromise. Intact healthy skin protects the body from the physical and chemical



**Figure 3.** A 0.5 cm incision was made on the side of the first layer of Vaseline gauze to avoid direct contact between wound and oil gauze. A Y shape incision was made on the second layer of gauze (A). Surgical spiral dressing techniques were applied (B). Dressing changes next day found that the gauze absorbed the wound exudate and became dry, hard, and adhesive to the wound. The removal of gauze again caused excruciating pain and epidermal avulsion (C).

penetration and pathogenic microbial invasion, while compromised skin increases the risk of catheter-related blood infection. After consultation with the Department of Dermatology, exfoliative dermatitis was diagnosed, with a possible cause of lenalidomide (**Figure 1D**) [9, 10]. During a routine exam of the PICC, we found that the PICC applicator was fixed and immobile at its entrance to the skin. Removal of the applicator would have resulted in epidermal avulsion (**Figure 2A**). Standard treatment would be removal of the PICC. However, maintenance of the PICC was deemed important due to the patient's poor condition and need for total parenteral nutrition and intravenous antibiotics. Reestablishing venous access would be very difficult given the systemic rash. After consultation with a multidisciplinary team and acquisition of the patient's consent, we agreed to keep the PICC to retain intravenous access. We initiated a regimen that included: the maintenance of skin moisture, encouraging the patient to avoid scratching, avoidance of precipitating factors, application of topical steroids, and treatment of the underlying cause and complications [11, 12]. A new plan for disinfection of the fixed catheter was developed by our multidisciplinary team and involved the application of povidone iodine (diluted 10 times to 500 mg/L). There were no signs of local infection and the catheter was maintained.

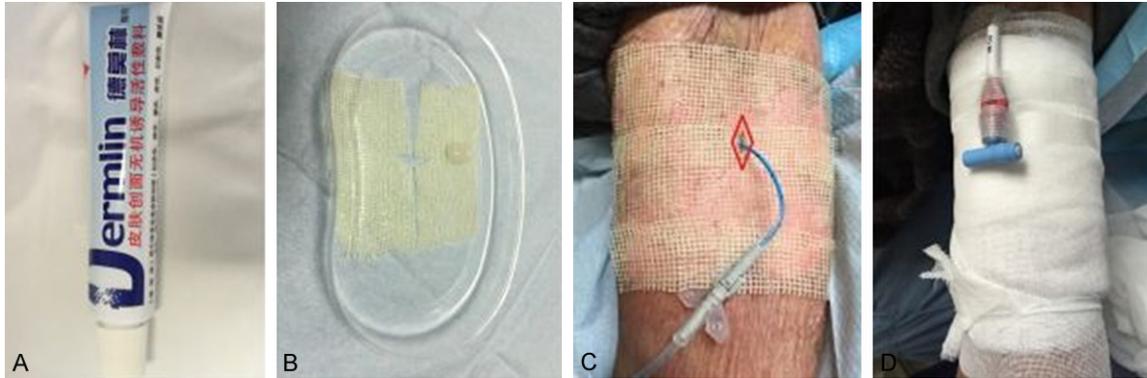
#### *Management of PICC line*

The absence of epidermis at the PICC insertion site increases the risk of catheter-related bloodstream infection and catheter slippage [8]. Because of the severity of the problem, a multidisciplinary team was established and consisted of a PICC specialist, wound specialist, nutritionist, and physicians and surgeons from the Departments of Oncology, Dermatology, Infectious Disease, and Burn Surgery.

#### *Catheter placement*

*Multidisciplinary consultation suggested the application of hydrocolloid dressings [13]:* The advantages of this dressing include strong adhesion and absorption of wound exudate. According to the characteristics of epidermal absence, we altered this approach by cutting a small piece from the upper right corner of the dressing pad and placing it under the catheter body, to avoid direct contact with the wound. We also replaced the missing part of the dressing with gauze for comparison (**Figure 2B**). However, the next day we found that the hydrocolloid dressing absorbed the exudate from the wound and completely detached from the wound, which imposed significant risk to the catheter fixation. The wound under the gauze bandage was dry and hard, not suitable for epi-

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**Figure 4.** Dermlin cream (A) was rubbed into the vaseline gauze with a small 0.5 cm incision on the side (B). The combination of Dermlin and the sterile vaseline gauze promoted wound healing and prevented the dressing from adhering to the wound (C and D).



**Figure 5.** Reformation of epidermis at two days (A), four days (B), six days (C) and eight days (D) of dressing changes.

dermal growth (**Figure 2C**), and the removal of the adhesive part caused epidermal avulsion (**Figure 2D**). Thus, this fixation was not appropriate. Experts from the Department of Burn Surgery suggested using a sterile and absorptive foam dressing. This could be problematic because the foam dressing is not adhesive. Once it expanded after absorption of the exudate, the risk of PICC slippage would be high [14, 15].

After reconsultation with the multidisciplinary team, we decided up on a trial of Vaseline gauze: Published reports [5, 10, 11] indicated that vaseline can keep the skin moisturized, which could not only promote the epidermis growth, but also effectively limit the skin infection. The introduction of gauze (**Figure 3A**) increased the absorption of exudate. Bandages were applied using surgical spiral dressing techniques, with consistent intensity of the roll-

ing (**Figure 3B**). The distal arterial pulse, fingertip feel, and active arm mobility were checked. After 2 days, we found that vaseline gauze did not function as expected, it became dry, hard, and adhesive after it absorbed the wound exudate. Although we used a large amount of isotonic saline to soak the dressing prior to a dressing change, the patient still experienced intense pain and injury when removing the dressing, leaving the wound with redness, (**Figure 3C**), meaning this method still needed to be improved.

Another reconsultation with the multidisciplinary team led to the application of Dermlin (Yenssen Biotech Co., Jiangsu, China) [16, 17], an inorganic sterile wound cream (**Figure 4A**): This product can induce human epithelial cell regeneration and neutralize the acid infiltration from the wound. A small 0.5 cm small incision was made on the vaseline gauze. Dermlin

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cream was rubbed into the vaseline gauze, while avoiding direct contact with the puncture and the catheter body (**Figure 4B**). The combination of the Dermlin and sterile vaseline gauze promoted wound healing and prevented the dressing from adhering to the wound (**Figure 4C** and **4D**). This method was feasible and the dressing was changed every other day.

### Follow-up

This method allowed successful and regular dressing changes (**Figure 5**). After 2 weeks of the transdermal patch with vaseline, 8 days (total) of dressing changes with Dermlin every other day, the epidermis had formed again. During the follow-up, there was no evidence of catheter slippage or catheter-related bloodstream infection. After treatment, the patient's basically recovered. The patient was recovered from exfoliative dermatitis at 3-month follow-up.

### Summary

Although we could not identify the precise cause of the exfoliative dermatitis, this case demonstrates how a multidisciplinary team was able to maintain PICC in this challenging clinical circumstance. There was no catheter related infection or slippage. After careful treatment and dedicated nursing care, the patient was eventually discharged. Moreover, our experience suggests that this method could be useful for burn patients with large areas of skin loss, since establishing intravenous access in them is also difficult. This could be a new alternative method for retaining PICC in the treatment of burn wounds.

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### Disclosure of conflict of interest

None.

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