Case Report

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The cadaveric human skin allograft as a paradigm shift for the management of a large wound of necrotizing soft tissue infection: an interesting case report

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ABSTRACT

Necrotizing soft tissue infection (NSTI) is an uncommon but fatal and rapidly progressing disease which requires emergent recognition and prompt treatment. Patients of NSTI frequently suffer from large soft tissue defects, which require coverage of these defects by auto-skin graft or flap cover. It becomes a challenge to cover the soft tissue defects in an already sick patient. The patient of NSTI has a restricted skin graft donor site and a poor skin grafting bed. Here authors report a case of 50 years old female, known case of type 2 diabetes mellitus, who suffered from NSTI post intramuscular injection of the left gluteal region. Her left thigh, left gluteal region, lower back, pubic and perineal region were involved. She underwent multiple radical debridement's followed by the use of Cadaveric human skin allografts to cover the raw area temporarily. Meanwhile, authors optimized the patient nutrition state and controlled the infections. Finally, raw areas were covered with an autologous skin graft, and the patient discharged in stable condition.

Keywords: Allograft, Auto-skin graft, Biological dressing, Cadaveric human skin allograft, Necrotizing soft tissue infection

INTRODUCTION

Necrotizing soft tissue infection (NSTI) is an uncommon but fatal disease that involves the skin, subcutaneous fat, fascia, and muscles.¹ It is a rapidly progressing disease that requires emergent recognition and prompt treatment in the form of radical multiple debridement's of all poorly perfuse tissue and ICU care.^{1,2} After the multiple debridement patient frequently suffers from large soft tissue defects and requires coverage of these defects by an auto-skin graft or flap cover. It becomes a challenge to cover the soft tissue defects in an already sick patient. At this time patient be in a catabolic state and requires extra nutrition and control of infections. The patient of NSTI

has a restricted skin graft donor site and a poor skin grafting bed. Auto-skin grafting makes the condition worse and further increases the raw area of the body along with the risk of infection at the donor site. All that leads to loss of available skin graft donor site which could be judiciously used later on.

Traditionally, the reconstruction of the large wounds was done with an autologous skin graft or vascularized flap cover. Autologous skin grafting is not easy in large tissue defects due to restricted donor-site availability and poor wound bed viability. In such defects use of human cadaveric skin allograft (HCSA) may be a paradigm shift in the management. HCSA is useful to cover the

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relatively deep wounds. Allograft decreases the infection and stimulates the neovascularization of the wound bed. This aids to reduce pain, decrease the loss of fluid, protein and electrolytes, and early wound cover temporarily. Meanwhile, it provides a crucial time to optimize the patient's general condition and control of infections.

CASE REPORT

A 50 years old female with a history of type 2 diabetes mellitus presented to the emergency department. The patient presented with chief complaints of pain and discoloration of the skin of the left buttock and thigh region for 4 days which was gradually increasing. There was a history of intramuscular injection of left gluteal region 7 days back for her old sciatica pain. Multiple fasciotomy incisions were done over the left gluteal region at another hospital. At the time of presentation, the patient was conscious, oriented. Her heart rate was 110/m, blood pressure was 100/70 mmHg and respiratory rate was 22/m. She was afebrile at that time but had a history of few spikes of fever 2 days back. After a detailed history and clinical examination, oozing pus was sent for gram stain and culture. Broad-spectrum antibiotics were started. Then the patient was admitted to the plastic surgery department.



Figure 1: The patient presented with NSTI post intramuscular injection of the left gluteal region involving left lower limb with the left gluteal region, and part of the lower back along with multiple incisions over the wound.



Figure 2: NSTI involvement of left anterior thigh with pubic and vulvar region with skin discoloration and multiple blisters formation.



Figure 3: After debridement of all unhealthy tissue and exposed underlying muscle and sciatica nerve.



Figure 4: A large amount of excised unhealthy tissue, skin, subcutaneous tissue, underlying fascia as well as necrotic muscles.



Figure 5: Human cadaveric skin allograft meshed and tailored to fit the cover of the wound, fixed with skin staplers.



Figure 6: After partial resection of allograft with slough and partially adherent human cadaveric skin allograft.



Figure 7: After debridement and auto-skin grafting of the wound, wound partially closed with local flap cover.



Figure 8: After 2 and half months of initial presentation with an almost healed wound over the left gluteal region, left thigh and lower back and completely healed skin donor site.

On local examination large area of skin discoloration and blister formation was seen over the left gluteal region extending distally over the left thigh, proximally over the lower back and anteriorly over the pubic and perineal regions. Multiple fasciotomy incisions were present in the dead skin (Figure 1 and 2). There was a foul smell from the wound discharge present. Dead skin was insensate but surrounding erythematic skin was hyper-aesthetic. Distal left leg neurovascular examination was normal. The Doppler study was normal for the left lower limb. The LRINEC score (laboratory risk indicator for necrotizing

fasciitis score) was sent. The patient was prepared for emergent debridement for all unhealthy tissue.

Debridement of all unhealthy tissue over the left gluteal region and left thigh was done within 24 hours of admission (Figure 3 and 4). A chunk of tissue was obtained for histopathology. On exploration, findings were suggestive of NSTI. The LRINEC score was 10 within 48 hours of admission and her HbA1C was 8.2. The culture report showed Staphylococcus aureus which was methicillin sensitive and antibiotics were changed accordingly. On day 4, discoloration of the skin of wound margins was noted and the patient was again taken for debridement of all unhealthy tissue. After a few days, again discoloration of the skin of wound margins and blister formation was noted over the pubic region. On day 8, the patient was taken for debridement of all unhealthy tissue.

Finally, she had lost 15% of her total body surface area. The wound was covered temporarily by cadaveric human skin allograft on day 14 (Figure 5). The allograft was tailored to fit the wound. The patient was responding well for the allograft treatment. Meanwhile, authors used the time to build up the patients' nutritional status and control of infections. After the 2 weeks rejection of allograft was started (Figure 6). Finally, patient underwent debridement and autologous skin grafting for all the raw areas on day 32 (Figure 7). The donor site healed adequately with no major infection and wound complications. The patient was discharged in satisfactory condition from the hospital on day 38 of admission (Figure 8).

DISCUSSION

NSTI have annual incidence of about 1.5 cases per 1 lac, but having high mortality about 20-30%. ³⁻⁵ NSTI most commonly involves the upper or lower limbs and trunk. ^{6,7} NSTI has two types. Type 1 is polymicrobial and frequently involves diabetic, immunocompromised, or old age patients. Type 2 is monomicrobial and generally found in young otherwise normal patients and caused by group A *Streptococci* (10%). ⁸⁻¹⁰ Group A *Streptococci* has been termed as 'Flesh-eating bacterium. ^{11,12} Diagnosis of NSTI is made based on history, examination, and operative findings. The commonly seen findings are redness, swelling, induration, skin discoloration, blister formation, surgical emphysema, and severe pain. ^{1,2}

Cadaveric human skin allograft is a good option in the management of large wounds post-NSTI. The current challenge is to quickly remove all the dead soft tissue early and to cover the debrided wound temporarily. Cadaveric human skin allograft plays a key role in this challenge when autograft donor sites are limited. Histological studies postulate that cadaveric skin does not actually "take" in the traditional sense. It is hypothesized that granulation tissue replaces the cadaveric skin, which

provides an appropriate matrix for the epithelial lining as shown in a study performed by Oliver et al. 13 cadaveric human skin allograft uses decreases the pain and risk of infections. It reduces the loss of water, protein, and electrolyte from the wound. It provides plenty of time for the optimization of patient condition. Availability and risk of infection are two drawbacks of cadaveric human skin allograft.

CONCLUSION

This case demonstrated the essential need and usefulness for the development of novel techniques like Cadaveric human skin allograft to cover the large wound in NSTI patients. The use of cadaveric human skin allograft avoids pain and risk of infections and provides plenty of time for the optimization of patient condition. However, the multidisciplinary team is required for the management of complicated cases of NSTI. Availability and risk of infection are two drawbacks of cadaveric human skin allograft.

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