

Early Identification and Nursing Intervention Experience of a Case of Necrotizing Fasciitis

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Abstract: *Objective:* To explore the key points of early identification and comprehensive nursing intervention strategy for necrotizing fasciitis patients, to improve the efficiency of clinical diagnosis and treatment and the quality of prognosis. *Methods:* The clinical data of a 70-year-old female patient with right-hand trauma complicated by infection progressing to necrotizing fasciitis were reviewed and analyzed. Laboratory, imaging, and surgical findings were integrated to summarize the early identification features and key nursing considerations. *Results:* The patient retained the affected limb, albeit with some functional limitations, following early identification, timely surgical debridement, broad-spectrum anti-infective therapy, and comprehensive nursing care. *Conclusion:* The early clinical manifestations of necrotizing fasciitis are often subtle, and the disease progresses rapidly. This necessitates heightened vigilance among medical staff in all healthcare settings. Implementing multidisciplinary collaboration and systematic nursing interventions can improve patient prognosis while reducing amputation rates and mortality.

Keywords: Necrotizing fasciitis; Early identification; Nursing intervention; Debridement; Functional preservation of limbs

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1. Introduction

Necrotizing fasciitis (NF) is a rare but extremely harmful acute suppurative soft tissue infection, with beta-hemolytic *Streptococcus*, *Staphylococcus aureus*, gram-negative bacilli, and anaerobic bacteria being the most common pathogens and it can also be a mixed infection. Its pathological feature is the rapid expansion of infection along the superficial and deep fascia planes, causing extensive necrosis of the fascia and surrounding soft tissues. The early symptoms lack specificity and are often misdiagnosed as cellulitis, deep abscess, etc., and it has entered the late stage skin necrosis, muscle exposure, and systemic septicemia symptoms appear. Although the incidence of this disease is low, the mortality rate is as high as 20% 30%, and the amputation rate is also high, with a high risk of disability. The key factors affecting the prognosis include: early recognition, prompt surgical, reasonable anti-infection, and comprehensive supportive treatment. For primary hospitals, early recognition is particularly difficult due to limited equipment and experience, and it is easy to miss the

surgical opportunity. This study, combined with a case of a 70-year-old woman who developed necrotizing fasciitis due to secondary infection after being stabbed a wooden splinter in her right hand, describes in detail the course of the disease, examination results, surgical and nursing intervention process, and summarizes the key indicators for clinical early recognition nursing points, aiming to improve the sensitivity and comprehensive handling ability of medical staff for this disease, and to provide a reference for future clinical rescue ^[1, 2].

2. Data and methods

2.1. Clinical data

A 70-year-old female patient was admitted to the hospital “redness, swelling, and pain in the right hand for 2 days after being pricked by a wooden splinter.” She had a history of underlying conditions due to age but no clear history of diabetes. Two days prior to admission, she sustained a wooden splinter injury to her right thumb at home. She attempted to remove it manually and then sucked the wound with her mouth. Subsequently, her right hand quickly became swollen and extremely painful. She was treated with ceftriaxone and tinidazole intravenous for infection and underwent incision and drainage of the dorsum of her right hand at an outside hospital. As her symptoms worsened, she was transferred to this current hospital. At present, her temperature was 36.7°C, pulse rate was 90 beats/min, respiratory rate was 20 breaths/min, and blood pressure 100/56 mmHg. Physical examination revealed three incisions on the dorsum of her right hand draining turbid fluid, blister formation in the space, marked swelling of her right forearm, and good peripheral circulation at the tips of her fingers.

Laboratory tests showed: WBC 14.23 $10^9/L$, neutrophil count 12.20 $\times 10^9/L$, hsCRP 286.75 mg/L, procalcitonin 5.27 ng/mL, erythrocyte sedimentation rate 59 mm/h; prothrombin time 14.30 s, ratio 1.24, activated partial thromboplastin time 32.50 s; D-dimer 0.91 $\mu g/mL$; creatine kinase 1099 U/L, creatine kinase-MB 56 U/L; sodium 132.6 mmol/L, chloride 98.8 mmol/L, lowest potassium 2.59 mmol/L; BNP 575.62 pg/mL. Liver function: Direct bilirubin 6.1 $\mu mol/L$, gamma-glutamyl transpeptidase 68 U/L. Electrocardiogram: Sinus rhythm, complete right bundle branch block. Multiple secretion cultures were negative, and nGS detected *Streptococcus pyogenes*, and another culture detected *Enterococcus*. Imaging suggested swelling of soft tissues in the right hand and forearm without obvious bone destruction.

2.2. Basic treatment and nursing methods

2.2.1. Basic treatment

After admission, the routine nursing of orthopedics was immediately performed, and diabetic diet management was implemented to prevent stress hyperglycemia; active completion of biochemical, coagulation, cardiac function, electrolyte, and bacterial culture tests were carried; the anti-infection scheme was cefoperazone-sulbactam metronidazole, followed by a change to imipenem-ilastatin sodium combined with linezolid to cover gram-positive, gram-negative, and anaerobic bacteria; mannitol was used for intravenous drip to swelling; potassium was supplemented orally and intravenously to correct hypokalemia; surgical treatment included the first right hand infected focus clearance VSD negative pressure flushing, and the second debridement suture local skin flap formation surgery.

2.2.2. Nursing methods

- (1) Close observation of vital signs and changes in condition

After admission, multi-parameter ECG monitoring system was set up according to the standards for the monitoring of critically ill infectious patients. The temperature, heart rate, respiratory frequency, and blood pressure were monitored and recorded. Temperature monitoring was performed every 2 hours, with the frequency increased to once an hour when the temperature fluctuated significantly or when chills and rigors occurred. Measurement site of the thermometer was unified to the axilla to ensure data comparability. Heart rate monitoring was performed using three-lead ECG, which displayed and recorded the rhythm morphology in real time. The changes in heart rate were closely correlated and analyzed with the degree of pain, the speed of infusion, and electrolyte changes. The respiratory frequency is verified synchronously through the respiratory waveform of the monitor and visual observation of the chest wall rise and fall. If there was any sign of rapid, superficial, or difficult breathing, the was immediately marked and the breath sounds were assessed.

Blood pressure monitoring used a combination of automatic pressure measurement and manual rechecking. Resting blood pressure was measured once every 4 hours at rest. If the blood pressure fluctuated by more than 20 mmHg or the systolic blood pressure was less than 90 mmHg, immediate intensive measurement was performed records were made. The degree of local pain was assessed using the numerical rating scale (NRS) three times a day, at the handover of morning, afternoon, and night, to ensure that the trend of pain change was clearly visible. The peripheral circulation was assessed by observing the skin color, temperature, capillary refill time, and peripheral capillary saturation. The capillary refill time was controlled within 2 seconds, and if it exceeded 2 seconds, it was immediately reported and recorded. The degree of edema was using a grading method (+~+++) and was combined with the measurement of finger and wrist circumference. The measurements were taken at a fixed time every day to facilitate comparison of data. All data were recorded in a special monitoring form and were checked with laboratory indicators simultaneously to facilitate comprehensive judgment of the evolution of the disease ^[3].

(2) Preoperative psychological nursing

In response to the patient's concerns about surgical risks, postoperative functional recovery, and potential impact on appearance, confidence was enhanced by sharing photos of similar cases and videos documenting the recovery process. At the same time, the possible incision position, drainage method, and postoperative wound management steps during the operation were explained to form an expected cognitive of the treatment process. When signing the informed consent form before the operation, the precautions were explained one by one to ensure that the patient signed for confirmation after full understanding. In the presence family members, they were instructed on how to cooperate during the postoperative visit and assist in changing the dressing, avoiding touching the drainage tube or sterile dressing.

On the day before, the patient was assisted in performing moderate limb relaxation training, taking a comfortable supine or semi-reclining position to avoid blood pressure and heart rate fluctuations caused by tension affecting preparation for surgery. The preoperative fasting and water deprivation time was strictly controlled within the range specified by the doctor's orders to avoid delaying the surgical opportunity. To the uneasiness caused by waiting, quiet companionship was provided during the intervals of surgical preparation, and discussions of negative topics unrelated to the disease were avoided. All preoperative psychological processes were fully documented, and the changes in the patient's psychological state and cooperation during the course of the disease were noted for the surgeon's reference ^[4].

(3) Preoperative preparation

After the surgical time is determined, the preoperative preparation process is initiated immediately, starting

with the verification of completeness and accuracy of the patient's identity wristband, medical records, and the surgical informed consent form, and confirmation of the surgical site. Blood samples were collected from the veins for a full panel, including complete blood count, biochemical profile, coagulation function, myocardial enzyme profile, electrolytes, infection markers, and cross-matching tests. Urgently needed results were marked as "preoperative rush" to ensure availability within one hour prior to surgery. Bedside electrocardiography is completed and the type of heart and conduction are recorded, and echocardiography is performed when necessary to assess cardiac function, focusing on ejection fraction and abnormalities in wall motion. Maintain at least two venous accesses, one for infusion and the other for rapid intraoperative fluid administration or blood transfusion, both using large-bore indwelling catheters to flow rate. The patient's history of drug allergies was reviewed, and in accordance with the physician's orders, antibiotics, hemostatic agents, and analgesics required during and after surgery were prepared in advance.

Blood products are prepared in advance according to the cross-matching results, stored in the blood bank, and properly handed over and confirmed with the operating room. The prepping includes the right forearm to the shoulder joint, and hair is shaved, with initial disinfection using iodine solution, followed by covering with sterile dressings until entering the operating room. To prevent preoperative hypothermia, electric blankets and temperature-controlled infusion devices are prepared. Complete preoperative body cleansing, assist the patient in changing into sterile gowns and caps, and remove jewelry such as rings and watches. Confirm the patient's fasting status before surgery, ensuring that the fasting and water-deprivation meets the requirements for safe anesthesia. All preoperative preparations are thoroughly documented, including the time, person performing the checks, test results, and preparation of items, and are confirmed the operating room and anesthesiology department to ensure no missing links ^[5].

(4) Postoperative care

Upon returning to the ward, the patient was placed in a warm and quiet environment, with continuous monitoring of vital signs. Particular attention was given to changes in blood pressure, heart rate, and respiratory rate during the first six hours postoperatively. The incision site was bandaged with sterile gauze, and the VSD negative pressure drainage device was placed in a fixed position to ensure that the drainage tube was not twisted, folded, or compressed, and the drainage bottle placed 30 cm below the incision plane to prevent backflow of fluid. The drainage volume and color were monitored hourly, with light red exudate being most common at this stage. If bright red blood appeared or there was a sudden decrease in drainage volume, the drainage tube's patency was to be checked immediately and the physician notified promptly. During daily dressing changes involving silver ion application, strict aseptic technique was maintained. The skin around the incision was cleansed with normal saline, iodine tincture, and hydrogen peroxide to remove exudate and secretions. A new sterile dressing was then applied and securely fixed in place.

The surgical site was assessed for signs of dehiscence, oozing, exudate, and changes in flap color. Skin temperature and tissue tension were recorded. The negative pressure status of the drainage device was checked twice daily and replaced or pressurized as needed to maintain effective negative pressure drainage. To prevent the affected limb from being compressed and suspended, keep the affected limb elevated at 15 to 30 degrees to facilitate venous reflux. Postoperative pain management was performed according to the doctor's orders, and dressing changes and passive activities were performed within the effective period of analgesia to reduce pain response. The timing of the first meal and first ambulation after anesthesia was carefully recorded. A semi-liquid diet was provided during the early postoperative period, while high-fat and hard-to-digest foods were

avoided. All the processes of incision and drainage care were recorded with detail in the medical record to assess the recovery progress.

(5) Nutritional support and electrolyte management

During the process of infection control and wound repair, the patient's basic metabolic needs were assessed. The total daily energy expenditure was calculated based on weight, height, and activity level to promote wound healing and restore immune function. For hypokalemia, intravenous potassium supplementation was given under medical advice and with monitoring of electrocardiogram, with the concentration controlled at $\leq 0.3\%$ and the speed not exceeding 20 drops/minute. Oral potassium chloride sustained-release tablets were given simultaneously, and the dosage was divided. For the management of hyponatremia and hypochloremia, isotonic sodium chloride solution was administered based on the patient's serum sodium and chloride levels. When necessary, combination preparations containing sodium, potassium, and chloride were also provided.

Blood electrolyte levels were closely monitored after each fluid infusion to prevent overcorrection and reduce the risk of neurological complications. Fluid intake and output were recorded daily, including oral fluid intake, infusion volume, urine output, drainage volume, and estimated sweat loss. The goal was to maintain fluid balance or achieve a slightly positive fluid balance. For patients with liver dysfunction, high-protein foods were appropriately restricted, while the intake of B vitamins and glutathione was increased to support liver function and reduce hepatic burden. Warm fluids were used preferentially during fluid infusion to prevent vasoconstriction caused by cold stimulation. For patients with insufficient nutritional intake or unable to tolerate oral feeding, enteral or parenteral nutrition support was given, and the supply was adjusted based on the results of blood glucose monitoring. All fluid infusions, as well as potassium and sodium supplementation, were administered under strict monitoring. The time, dosage, and method of administration were accurately documented in the fluid balance chart.

2.3. Observation indicators

Changes in local symptoms of the patient's hand—including swelling, pain, blistering, and necrotic areas—were monitored, along with systemic infection indicators such as white blood cell count (WBC), C-reactive protein (CRP), procalcitonin levels, and body temperature. Surgical findings, etiological results, changes in intestinal and cardiac function, in-hospital complications, amputation rate, and functional preservation were also closely observed and documented.

3. Results

After two thorough debridements, continuous VSD negative pressure flushing, broad-spectrum anti-infection therapy, systematic support, and meticulous nursing, the patient's wound granulation grew well, local infection was controlled, and inflammatory markers significantly decreased (WBC decreased to $6.73 \times 10^9/L$ after the operation, CRP decreased to 29.30 mg/L), and procalcitonin decreased to 0.18 ng/mL. During the hospital stay, hypokalemia and hyponatremia were corrected, anemia was improved, and cardiac function was stabilized. The patient did not undergo amputation, and the right hand was preserved, but there was partial functional limitation. The discharge instructions were to change the dressing once every two days and to continue with rehabilitation training.

4. Discussion

The issue in early identification of necrotizing fasciitis lies in the lack of specificity in clinical manifestations, which is often misdiagnosed as simple cellulitis. In this case, although the patient did not have typical manifestations such as skin purplish discoloration, necrosis, and massive exudation of pus, combined with the history of trauma, rapidly worsening swelling and pain, significantly elevated laboratory inflammatory markers, and path detection results, a high suspicion of NF should be made, and immediate surgical exploration and debridement should be taken. This case suggests that nursing staff need to pay attention to the following: (1) For patients with trauma combined with rapidly progressive swelling and pain, a full-body assessment and infection index monitoring should be performed at the first time, and timely reporting to doctor should be made when CRP, PCT are significantly elevated or when pain and local manifestations are disproportionate; (2) Preoperative nursing should be rapid and comprehensive to ensure patients complete preoperative preparations in the shortest time possible and strive for surgical timing; (3) Postoperative wound and drainage care is the key to prevent infection recurrence, and it is necessary assess the patency of the drainage and the condition of the wound every day to prevent tube blockage and retrograde infection; (4) Electrolyte disorders such as hypokemia and hyponatremia are common concomitant problems in severe infections, and nursing staff should closely monitor, supplement fluids and potassium according to doctor's orders, and electrocardiographic changes; (5) Psychological nursing runs through the whole process, the elderly patients often accompany anxiety and fear, nursing staff need to actively communicate, explain the of treatment, and enhance the compliance of patients; (6) Rehabilitation nursing should be intervened as early as possible after infection control, and avoid long-term immobilization of hand leading to joint contracture and muscle atrophy.

5. Conclusion

Necrotizing fasciitis is a rapidly progressive and highly lethal infectious disease. Early recognition and timely surgery are key to reducing mortality and amputation rates. Nursing staff should maintain a high level of clinical vigilance to promptly identify suspected cases and collaborate with physicians for rapid decision-making and intervention. Accurate management of drainage, wound care, fluid balance, and psychological support during the perioperative period—along with strengthened nutritional and rehabilitation guidance—can significantly improve both the survival rate and quality of life for patients. Although this case was managed in a grassroots hospital, effective medical-nursing collaboration and comprehensive interventions led to limb preservation and infection control, providing valuable reference for nursing practice in similar cases.

Disclosure statement

The authors declare no conflict of interest.

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