Cause Analysis and Nursing Outcome Evaluation of Allergic Contact Dermatitis at the Arteriovenous Fistula Site in a Hemodialysis Patient: A Case Report

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Abstract

Objective: To summarize the etiological analysis and evaluation of nursing outcomes for a case of allergic contact dermatitis at the arteriovenous fistula site in a hemodialysis patient.

Methods: The nursing interventions focused on identifying the causative factors, specifically the medical consumables including hemostatic patches, puncture needles, adhesive fixation tapes, and disinfectant solutions that routinely contacted the patient's fistula site skin. Based on the patient's exposure history to these items and solutions, the pathogenic factors were identified through an elimination method. Prior to this investigation, appropriate management of the affected area was promptly instituted under the medical team's recommendation, including topical application of dexamethasone ointment to cover the inflamed region. Subsequently, the disinfectant was empirically replaced. Furthermore, a warning label was affixed to the patient's medical record cover, secondary handover was performed via online communication platforms, family members were contacted, and the patient's condition was closely monitored. Finally, health education was provided to the patient regarding ointment application techniques and skin care protocols for the affected area. Approximately one week later, the cutaneous inflammation at the fistula site had resolved and pruritus had completely subsided.

Full Text

Cause Analysis and Nursing Effectiveness Evaluation of Allergic Contact Dermatitis at a Hemodialysis Patient's Arteriovenous Fistula: A Case Report

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Abstract

Objective: To analyze the causative factors and evaluate the nursing effectiveness in a case of fistula-related allergic contact dermatitis in a hemodialysis patient. **Methods:** The nursing approach focused on identifying triggers through systematic investigation of medical consumables in daily contact with the fistula site, including hemostatic patches, puncture needles, fixation tapes, and disinfectants. Using an elimination method based on the patient's contact history with these materials, potential allergens were identified. Prior to this investigation, appropriate local care was initiated as recommended by the medical team, including topical application of dexamethasone ointment to cover the inflamed area. Empirical replacement of the disinfectant was implemented subsequently. The patient's medical record was clearly labeled, secondary handover was conducted through online communication, and family members were contacted to ensure close monitoring of the condition. Finally, health education was provided regarding ointment application and skin care techniques. **Results:** The skin inflammation at the fistula site subsided and pruritus resolved within approximately one week. **Conclusion:** [Note: The conclusion appears to be missing from the original text.]

Keywords: arteriovenous fistula, allergic contact dermatitis

The arteriovenous fistula serves as the critical "traffic hub" connecting the patient to the dialysis circuit, while the skin acts as the essential protective barrier for the fistula vasculature. Patients undergoing regular hemodialysis experience punctures at the same site 2-3 times weekly, and repeated stimulation significantly increases the risk of developing irritant contact dermatitis. Persistent local pruritus leads to continuous scratching, which compromises skin integrity and elevates the risk of fistula site infection [1].

Case Presentation

A 65-year-old female patient with a junior high school education was diagnosed with chronic renal failure in 2012 and initiated maintenance hemodialysis in 2021. She has been on regular dialysis for over three years via a left forearm arteriovenous fistula, receiving treatment on Monday, Wednesday, and Friday mornings. She is anuric with a target dry weight of 52 kg, 5% dry weight of

2.2 kg, and an average weekly ultrafiltration volume of 2.5 L. Noteworthy laboratory findings from the past month include phosphorus 2.0 mmol/L, calcium 2.21 mmol/L, and parathyroid hormone 45.2 mmol/L. During one dialysis session, the nurse observed erythema, punctate rash, and scattered scratch marks within the disinfection area around the puncture site of the arteriovenous fistula, without ulceration, covering approximately 15 cm × 8 cm with well-demarcated borders. The patient reported pruritus lasting over two weeks.

Based on observation of the surrounding skin and dermatological principles, the patient was diagnosed with contact dermatitis—an acute or chronic inflammatory reaction occurring at skin-mucosa contact sites following exposure to exogenous substances. This case aligned with allergic contact dermatitis, characterized by a latent period, recurrence upon re-exposure, and repeated episodes [2].

Nursing Interventions

2.1 Local Skin Care

As the etiology remained unclear, immediate measures were implemented during that dialysis session. The adhesive tape from the nursing kit was discontinued and replaced with medical paper tape. The routinely used An'er iodine Type 2 disinfectant and chlorhexidine gluconate were suspended, replaced with 75% alcohol applied within 10 cm of the puncture site, twice, followed by saline application to the affected area. Dexamethasone ointment was applied locally [3] and covered with sterile gauze. This protocol was repeated at each puncture. On non-dialysis days, the ointment was applied twice daily. The inflammation resolved after approximately one week.

2.2 Health Education

Disease awareness: The elderly patient had limited education and poor understanding of contact dermatitis. Visual materials including images and videos, supplemented by verbal explanation, were used to enhance her comprehension and reduce recurrence risk. The importance of avoiding scratching to prevent fistula infection secondary to skin damage was emphasized.

Daily living guidance: The patient was advised to avoid spicy and irritating foods and seafood. Cotton underwear was recommended for its softness and skin-friendly properties. High-phosphorus diet control and proper phosphate binder usage were reinforced to prevent intense systemic pruritus from hyperphosphatemia. Appropriate ultrafiltration volume planning was implemented to avoid excessive skin dehydration. Additionally, regular WeChat communication was established with the patient and family to monitor skin condition timely.

2.3 Individualized Care Planning

Regular communication with the patient and family facilitated ongoing monitoring of skin status. Following retrospective review of the patient's history, a personalized care plan was developed, including: labeling the medical record cover prominently and ensuring handover through both workgroup messaging and face-to-face briefing between the primary nurse and unit staff.

Cause Analysis

3.1 Conditions for Allergy Development

3.1.1 Skin Factors As a regular hemodialysis patient undergoing renal replacement therapy that mimics kidney function, the procedure removes intravascular fluid and excess toxins, resulting in stratum corneum dehydration and transepidermal water loss. Uremic patients experience reduced sweating and impaired electrolyte excretion through sweat glands, leading to dry skin. Abnormal calcium-phosphorus metabolism, secondary hyperparathyroidism, increased mast cells, and neuropathy contribute to pruritus affecting 67%-86% of dialysis patients, exacerbating dermatitis and causing significant distress [4].

1.2.1 Medical Consumables Literature reports that the needle hub and adhesive tape in fistula nursing kits can cause allergic reactions [5]. However, as shown in [Figure 1: see original paper], the distribution and location of punctate erythema did not completely correspond to the size and position of the needle hub, making this unlikely.

1.2.2 Disinfectants According to the 2021 edition of the Blood Purification Standard Operating Procedures, skin disinfectants for native arteriovenous fistulas need not follow the same protocol as those for artificial grafts (which require chlorhexidine or iodophor). Type I An'er iodine disinfectant and 75% alcohol are acceptable alternatives for fistula puncture site disinfection [6]. However, approximately 8% of patients develop irritant contact dermatitis from disinfectants [1].

2.1 Nursing Practice Implications Nursing methods require urgent improvement, and nurses must implement evidence-based practice rather than becoming desensitized by workload. The arteriovenous fistula is the lifeline for dialysis patients, making prevention and reduction of complications critically important. Fistula care is influenced by multiple factors including individual patient differences, nursing technique, regional economic conditions, and patient acceptance and attitude. Nurses must conduct comprehensive pre-puncture assessments rather than functioning merely as "needle operators." Preventive measures must be strengthened, aseptic technique strictly followed during hemodialysis, and patient concerns carefully elicited and addressed. Problems should be identified and resolved promptly. Nurses should summarize experiences and

implement specialized nursing measures tailored to individual patients, focusing on details to achieve effective care that demonstrates medical compassion. This case experience should not be overgeneralized but is shared with colleagues to promote exchange and contribute to improved fistula care for dialysis patients.

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Note: Figure translations are in progress. See original paper for figures.