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Experience of Rapid Rehabilitation Nursing Model in Perioperative Application of Left Whole Lung Resection in One Case of Congenital Ichthyosis Combined with Tuberculous Pulmonary Necrosis

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Abstract: This study summarizes the application and effectiveness of rapid rehabilitation nursing in patients with congenital ichthyosis combined with tuberculous lung destruction who underwent left total pneumonectomy. This study aims to provide empirical evidence and key nursing methods for future similar surgeries. A retrospective analysis was conducted on the clinical data of one patient admitted to our hospital who underwent left total pneumonectomy due to congenital ichthyosis combined with tuberculous lung destruction. The study summarized perioperative nursing measures, including preoperative skin care, airway preparation, psychological care, postoperative vital signs monitoring, airway management, skin care, and observation and care of complications. The patient successfully completed the surgical period with meticulous perioperative nursing, had a good postoperative recovery, and no severe complications occurred, leading to a full recovery and discharge. Conclusion For patients with ichthyosis combined with pulmonary tuberculosis who undergo left total pneumonectomy, comprehensive and meticulous perioperative nursing is an essential guarantee for surgical success and patient recovery.

1. Introduction

Ichthyosis is a hereditary keratinization disorder characterized by dry skin with fish-scale-like scales. Clinically, it has multiple subtypes including common ichthyosis (autosomal dominant and X-linked inheritance), congenital ichthyosiform erythroderma (dominant and recessive inheritance), and lamellar ichthyosis[1], with rare clinical reports and only isolated cases documented. The treatment of tuberculous destruction lung has long been a clinical challenge. Chronic tuberculosis-induced extensive fibrosis and caseous necrosis[2] in the lungs are often irreversible, with anti-tuberculosis drugs struggling to penetrate affected areas. Prolonged medication use also promotes drug-resistant bacterial development, leading to suboptimal therapeutic outcomes[3,4]. Moreover, patients with destruction lung frequently excrete bacteria, facilitating tuberculosis dissemination and posing significant public health risks. Combined with symptoms like coughing, hemoptysis, and dyspnea that severely impair quality of life and may even be life-threatening, surgical intervention has become the primary treatment option[5]. However, patients with ichthyosis

complicated by tuberculosis are relatively rare, and their surgical risks are higher compared to those without ichthyosis. Perioperative care presents multiple challenges, particularly in maintaining skin integrity and preserving intravenous access. This article summarizes nursing experiences from a case report to provide clinical reference. The case details are presented below:

2. Clinical data

Patient B, a 36-year-old female, was admitted with chief complaints of "intermittent coughing, sputum production, chest tightness, and shortness of breath for ten years, worsening over the past week." Her temperature was 36.5°C, pulse rate 88 bpm, respiratory rate 22 breaths/min, and blood pressure 120/70 mmHg. Blood gas analysis revealed hypoxemia upon admission. The patient had no history of hypertension, diabetes, surgery, or allergies. Skin examination showed erythema, thickened skin with extensive lichenoid hyperplasia resembling armor, without blisters. Systemic hair loss and bilateral eyelid closure abnormalities with cataracts (claimed present since birth) were observed. No specific medications were available in major hospitals nationwide. No family history of similar cases was reported. After comprehensive examinations, she underwent left total pneumonectomy and pleural lesion resection under general anesthesia on May 30. The procedure went smoothly, with postoperative placement of one closed thoracic drainage tube and one deep vein catheter. She was transferred to the ICU for close monitoring of vital signs, strict observation of tracheal position, intermittent opening of the closed thoracic drainage tube, rigorous respiratory management, and psychological care. The closed thoracic drainage tube was removed four days postoperatively, and she was discharged 13 days after surgery.

3. Preoperative care

3.1 Preoperative routine preparation

In accordance with rapid rehabilitation nursing protocols, patients should receive blood preparation and preoperative antibiotics as prescribed one day prior to surgery. A 4-6 hour fasting period and a 2-hour no-drink protocol are required. On the evening of the preoperative day at 22:00, administer 400ml of medical-grade carbohydrate-based formula food orally. On the morning of the procedure day, the patient should consume 200ml of the same formula food. Patients should bathe and change clothes the night before the operation to maintain personal hygiene. Nursing staff should provide the patient with clean, comfortable cotton clothing upon waking on the morning of the procedure. All valuables should be entrusted to the patient's family members for safekeeping.

3.2 Respiratory Preparation

After admission, patients should be instructed on proper exercise methods for pulmonary function recovery, such as pursed-lip breathing, balloon blowing, and rehabilitation therapy using respiratory trainers. To prevent postoperative dyspnea caused by respiratory muscle injury, patients can also learn abdominal breathing techniques: cross hands over the abdomen, feeling abdominal expansion during inhalation and contraction during exhalation. Daily practice should last 10-15 minutes. Preoperative nebulized medications should be administered, and patients should be advised to cough up phlegm to prepare the airways. Given that the patient has both tuberculosis infection and congenital pulmonary hypoplasia (affecting lung development), effective pulmonary function enhancement methods should be explained to improve surgical tolerance. In this case, both the patient and family demonstrated good cooperation and acquired essential knowledge before surgery.

3.3 Preoperative cough and sputum clearance training

During the 1-3 days prior to surgery, patients were instructed to practice effective coughing techniques in bed. The training involved positioning the patient comfortably with a soft pillow under the abdomen. The procedure began with 5-6 deep breaths followed by several rapid, short coughs to help expel phlegm to the throat area. Patients then performed forceful coughing to expel the remaining mucus. This patient had already mastered proper coughing techniques before surgery, resulting in better postoperative cooperation and successful expulsion of phlegm.

3.4 Practice before and after the procedure

The rapid recovery nursing model requires the removal of indwelling urinary catheters immediately after surgery. However, as this is a total lung resection procedure, patients are advised to remain bedridden for one week postoperatively to prevent severe mediastinal movement. Therefore, it is not advisable to perform bladder or bowel functions while lying down. Consequently, we instruct patients to practice these activities in bed the day before surgery, which helps them adapt to early postoperative physiological needs more effectively.

3.5 Mental nursing

Tuberculosis patients are inherently prone to pessimism and anxiety. The patient's ichthyosis condition with severe facial keratinization further exacerbates feelings of inferiority. Additionally, compared to other lung surgeries, pneumonectomy causes more significant postoperative respiratory impairment. These factors collectively contribute to preoperative psychological stress, including surgical phobia, lack of confidence in surgeons, and concerns about complications like surgical failure or postoperative pain - all of which may intensify pessimistic tendencies. Combined with worries about treatment costs and prognosis, the psychological burden becomes overwhelming. Nurses should promptly assess patients' mental states, introduce competent surgeons, anesthesiologists, and nursing teams to alleviate anxiety. During preoperative evaluations, nurses should demonstrate meticulous observation and provide patient-centered explanations about the procedure's importance. Where possible, peer support among patients can be facilitated to boost confidence in overcoming the disease.

4. Postoperative care

4.1 Observation of vital signs

Postoperative monitoring is performed using a multifunctional cardiac monitor to track vital signs (T, P, R, Bp). Vital signs are measured every 15-30 minutes, with temperature readings taken every 4 hours. CVP (Central Venous Pressure) is monitored every 2 hours, and fluid administration is adjusted accordingly to maintain CVP at 6-12 cmH2O. Blood gas samples are drawn as scheduled per medical instructions, and oxygen therapy parameters are adjusted based on test results. Any changes in vital signs require immediate notification to the physician for intervention.

4.2 Care of various pipelines

The primary purpose of postoperative chest drainage tube placement is to effectively drain accumulated air and fluid in the thoracic cavity. The color, nature, and volume of drainage fluid can help identify complications. To maintain drainage patency, repeated compression should be

performed while closely monitoring these parameters, with immediate reporting to the physician if abnormalities are detected. However, since bilateral thoracic pressure imbalance may occur after pneumonectomy due to unilateral lung tissue removal, the drainage tube should remain clamped during surgery and periodically opened. When opening the tube, medical staff must remain present to prevent mediastinal oscillation and subsequent complications like severe arrhythmias. After blood pressure stabilizes postoperatively, the head of the bed should be elevated by 30°. The nursing staff should gradually increase the bed elevation to 45° according to the patient's condition, which helps lower the diaphragm and expand thoracic volume for better respiration. According to rapid recovery protocols, urinary catheters may be removed upon returning to the ward if no special requirements exist, with nursing assistance for bed or bedside toileting. However, as this patient underwent pneumonectomy, the urinary catheter is retained for two days to prevent mediastinal oscillation caused by bed movement, pending stabilization of the condition.

4.3 Postoperative respiratory care

The patient, who also had congenital pulmonary hypoplasia alongside tuberculosis, faced significant surgical challenges and high nursing risks. Postoperative bed rest for one week hindered expectoration, making effective sputum clearance crucial during recovery. After stabilizing vital signs, patients were encouraged to cough and expel phlegm while practicing deep breathing to maintain airway patency and prevent pulmonary infections. Following medical instructions, nebulization therapy was administered 4-5 times daily with intervals of 2-3 hours. Intravenous administration of ambroxol hydrochloride (30mg) mixed with 100ml saline solution was given three times daily to enhance expectoration. Physical interventions included mechanical suction devices (2-3 times daily) and 10-15 minutes of back percussion after nebulization. Tracheal suction was performed when thick sputum could not be expelled. Through meticulous nursing care, the patient achieved excellent postoperative recovery without developing pulmonary infections.

4.4 Vascular care

The clinical manifestations of ichthyosis patients vary significantly depending on the causative gene, with differences in severity closely linked to specific mutation sites[6]. This patient exhibited dark brown, thickened, cracked, and dry skin resembling armor without blisters. According to the patient's family history, the condition emerged during childhood without a family history, leading to a diagnosis of ichthyosis. The primary challenge for nurses was vascular selection and venipuncture fixation. After thorough disinfection, nurses selected a relatively normal upper limb vein for needle placement to avoid repeated punctures causing additional skin damage. Medical dressings proved inadequate for fixation, necessitating elastic bandages while monitoring blood circulation and skin color changes. During surgery, a right internal jugular vein catheterization was performed and maintained postoperatively. Postoperative care included daily iodine disinfection of the puncture site, sterile gauze coverage, and simple adhesive bandage fixation. Elastic bandages were applied externally, with close monitoring for neck pressure sensations to prevent complications from excessive tightness.

4.5 Skin care

Total lung resection surgery requires patients to remain bedridden for one week due to anesthesia and surgical demands. Skin care is particularly crucial for pressure-prone areas without fat protection, such as bony prominences lacking muscle coverage or with thin muscles (e.g., sacrococcygeal region, heel). Postoperative instructions require family members to assist patients in

changing positions regularly. When adjusting positions, gentle movements are essential to avoid rough handling that may cause skin flaking. Any skin debris should be removed gently to prevent tearing. During wound dressing changes at the surgical site and deep vein catheter placement sites, especially when removing adhesive tape, extreme force must be avoided to prevent tissue damage. For patients with ectropion, saline-soaked gauze can be applied intraoperatively to prevent ocular injury. Postoperatively, erythromycin ointment can be used to maintain eyelid moisture, while moisturizers like dried fish oil ointment, compound glycerin, or vitamin E cream may be applied to local skin. Systemic retinoid medications may also be prescribed. The responsible nurse must closely monitor the patient's skin condition during each shift and document observations.

4.6 Psychological care

Patients with ichthyosis experience full-body keratinization and hair loss. This condition not only affects their appearance but also causes significant inconvenience in daily activities, leading to anxiety, depression, low self-esteem, and feelings of disappointment and helplessness. During hospitalization, caregivers should regularly engage patients in conversations to listen to their concerns, promptly identify psychological changes, and skillfully alleviate anxiety and tension. After discharge, family members should be encouraged to show care and visit patients frequently, providing emotional support and strengthening their confidence in overcoming the disease[7]. Therefore, nurses should conduct thorough preoperative education and guidance, encourage patients to maintain a positive mindset, reduce anxiety and stress, ensure adequate rest, and promote postoperative recovery to minimize complications.

4.7 Wound care

Due to skin conditions, the chest wound couldn't be secured with bandages after suturing. A chest brace was then applied externally to prevent dressing detachment and protect the wound. Nursing staff should maintain room temperature through regular ventilation, ensure patients' clothing remains dry for timely changes, and prevent exposure to cold to avoid complications such as pulmonary infections.

4.8 Dietary care

Patients with ichthyosis should consume more protein-rich foods containing calcium and vitamins, such as bean sprouts, mung bean sprouts, tofu, and tomatoes. They should also eat plenty of vegetables and fruits like white radish, Chinese cabbage, cucumber, bitter gourd, and water spinach. Healthcare providers should advise patients to abstain from raw, cold, greasy, and irritating foods including fish, seafood, and chili peppers to boost skin barrier function and lower infection potential.

4.9 Pain care

The International Society for Pain (ISAP) defines pain as an unpleasant sensory and emotional experience accompanied by actual or potential tissue damage. With the advancement of nursing practices, care has expanded beyond functional management to emphasize humanistic and patient-centered care. As pain, a subjective perception of patients, causes significant physical and psychological harm, severe cases can not only impair work performance but also erode life confidence. Healthcare providers should therefore prioritize pain management, offering high-quality analgesic services. Postoperative care should involve administering analgesics as prescribed,

including intravenous pain pumps or oral medications, based on individual patient conditions.

5. Conclusion

Ichthyosis is a group of keratinosis diseases characterized by clinical scaly appearance, caused by dysfunction in epidermal cell dynamics or abnormal differentiation. These conditions result from congenital genetic defects and are classified with complex classifications due to genetic heterogeneity and clinical variability. To date, over 20 types of ichthyosis and ichthyosis syndromes have been identified by researchers worldwide. The patient's skin manifestations in this case align with typical features of non-bullous ichthyosiform erythroderma, though genetic testing was not performed due to technical limitations. Non-bullous ichthyosiform erythroderma is an exceptionally rare autosomal recessive genetic skin disorder with an incidence rate of approximately 1 in 200,000. Dry skin and desquamation combined with tuberculosis infection may weaken skin resistance and increase infection risks, as there are no specific treatments available. The severe impact of ichthyosis on patients' appearance often leads to neglect of skin protection, potentially worsening the condition. Clinical management should include protective skin measures, strict disinfection protocols, psychological support, enhanced nursing responsibility, close monitoring, and moisturizing topical medications to stabilize the patient's condition. Pulmonary tuberculosis resection surgery remains one of the most complex thoracic procedures, with postoperative complications including pulmonary infections and bronchopleural fistulas. Through the collaborative efforts of medical staff, we conducted a thorough analysis and discussion on potential perioperative nursing challenges. This initiative significantly enhanced preoperative preparations and postoperative care, particularly in areas such as preoperative rehabilitation exercises, respiratory management, effective sputum clearance, skin protection, and nutritional support. These improvements achieved remarkable outcomes, playing a crucial role in ensuring surgical effectiveness. The experience provides valuable reference for future similar procedures. Patients were discharged smoothly 13 days after surgery. Detailed discharge instructions were provided: Healthcare providers should recommend using lukewarm water for bathing without soap or irritating cleansers, applying moisturizing skincare products immediately after cleansing, protecting the eyelids to prevent vision impairment, and maintaining proper body warmth to avoid cold-induced pulmonary infections. Follow-up visits within one month showed patients had recovered well.

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