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Perioperative Nursing Care for a Case of Replantation of a Hand with Four-Finger Multi-planar 20-segment Amputation

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Abstract: Finger reimplantation is a pivotal technique in microsurgery, playing an irreplaceable role in restoring the functional integrity of fingers, maintaining the aesthetic appearance of the hand, ensuring the patient's ability to perform delicate hand operations, and enhancing their social participation and quality of life. This paper reports on the perioperative nursing approach employed in a successful case of replantation involving a single hand with a multi-planar, 20-segment amputation of four fingers. By establishing a specialized nursing team, conducting a comprehensive assessment of the patient's condition, formulating a personalized nursing plan, and implementing precise nursing care, we achieved successful outcomes. After nearly four weeks of meticulous diagnosis, treatment, and nursing, 17 segments of the replanted fingers survived, preserving the functional length of the amputated fingers and maximizing the restoration of hand function. This nursing method provides valuable insights and approaches for effectively managing vascular crises following digital replantation, improving the replantation survival rate, and enhancing patient satisfaction.

Keywords: Finger amputation; Reimplantation; Vascular crisis; Personalized care

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1. Introduction

Finger reimplantation is a sophisticated and advanced technique within the field of microsurgery that restores blood circulation and physiological functions to amputated fingers through meticulous anastomosis of tissues, including blood vessels, nerves, and tendons [1]. This surgical procedure holds paramount clinical significance in maximizing the preservation of both the appearance and functionality of the hand, alleviating the physical and psychological trauma experienced by patients, and facilitating their return to normal life and work. Nursing care during the perioperative period of finger replantation, guided by scientific and personalized interventions, is a pivotal component in ensuring the success of the surgery and promoting the survival of the replanted fingers [2].

It is essential for reducing the incidence of complications such as vascular crises and improving the functional prognosis of the patient's fingers. This paper presents a case where a patient with multi-planar 20-segment amputations of the second to fifth fingers of the right hand underwent a successful 13-hour replantation surgery. Following four weeks of meticulous diagnosis, treatment, and nursing care, the replanted fingers demonstrated good survival and functional preservation. This case study explores the clinical application value of perioperative nursing care in complex digital replantation, emphasizing its role in safeguarding surgical outcomes and promoting patient rehabilitation.

2. Case study

The patient, a 53-year-old female, presented to the hospital on January 18, 2025, three hours after sustaining a complete multi-planar amputation involving 20 segments distal to the middle of the proximal phalanges of the second to fifth fingers of her right hand due to an accidental cut from a vegetable slicer at work. The amputation resulted in the loss of 20 segments, extending from the middle of the proximal phalanges to the distal nail beds, specifically comprising 5 segments from the index finger, 6 segments from the middle finger, 5 segments from the ring finger, and 4 segments from the little finger. The longest segment measured 10 mm, while the shortest was 3 mm. The amputated parts were pale, cold, and exhibited clean-cut ends with moderate contamination. Active bleeding was noted at the proximal ends, and the patient displayed signs of severe systemic anemia.

2.1. Treatment

Prior to surgery, all physicians and nurses developed the surgical and nursing plans. An emergency finger reimplantation was performed on the night of January 18. The operation was initiated simultaneously by 13 doctors, divided into four groups. Group 1 was responsible for the debridement of the proximal ends of the second to fifth fingers of the right hand and the five-segment sequence of the index finger. Group 2 handled the six-segment sequence of the middle finger. Group 3 managed the five-segment sequence of the ring finger, while Group 4 took charge of the four-segment sequence of the little finger. Thorough debridement, fixation, and replantation were subsequently performed under a microscope. A total of 30 arterial anastomoses, 24 venous anastomoses, and 34 nerve sutures were completed. Blood flow was restored in the sequence of the index finger, middle finger, ring finger, and little finger, with all achieving successful blood circulation in a single attempt. Blood circulation was successfully established in all 20 segments of the second to fifth fingers of the replanted right hand.

3. Nursing care

3.1. A specialized nursing team of establishment

The establishment of the nursing specialization team comprises a deputy director of the nursing department, a head nurse of the department, an additional head nurse, four national orthopedic specialist nurses, and twelve backbone nurses. The deputy director of the nursing department serves as the team leader and is responsible for the development of the nursing program for the patient. The head nurse is tasked with organizing the entire department's nurses to learn the nursing program, leading the team in its implementation, and evaluating the nursing outcomes.

3.2. Formulation of the nursing program

Through a comprehensive literature search on finger replantation across various databases, including PubMed, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang Medical Network, and VIP Full-text Database, we extracted pertinent evidence. Following group discussions, a personalized nursing plan tailored to the specific needs of the patient is formulated.

3.3. Postoperative observation of local blood circulation

A vascular crisis risk assessment scale was utilized to promptly evaluate the risk level of vascular crisis occurrence, with risk warning signs displayed accordingly. Close monitoring of skin temperature, color, pads tension, and capillary refill of the replanted fingers was conducted. A color comparison card was employed to accurately observe color changes in the replanted fingers, while the clock positioning method was adopted to precisely describe the specific locations of any abnormalities. Nurses shared images or videos of the patient within the department's medical and nursing team, allowing team members to assist in evaluating the blood circulation status, thereby minimizing deviations and omissions that might arise from a nurse's solitary observation. In the event of abnormal blood circulation, timely and precise interventions were implemented [3]. A pulse oximeter was utilized to accurately monitor the oxygen saturation of the affected fingers, providing a more precise assessment of their blood circulation status [4]. For cases involving multiple fingers and multi-segmental replantation, both horizontal and vertical comparisons of blood circulation were conducted. Horizontal comparisons were made between the affected fingers themselves and between the affected fingers and healthy fingers, while vertical comparisons were made between the current and previous assessments within the same shift, as well as between the current shift and the preceding one [5].

3.4. Management of vascular crisis

On the first postoperative day, the distal segments of the replanted index, middle, ring, and little fingers of the patient displayed a dark red hue, slightly elevated tension, and a relatively rapid capillary refill response. Following a dressing change and the removal of oozing blood, the condition returned to normal. However, during the night of the third postoperative day, the distal segments of the replanted fingers exhibited a deepening of the dark red coloration, a slight decrease in skin temperature, increased tension, and a more rapid capillary refill response, indicating a potential venous crisis. Subsequent to a local incision at the wound edge or nail bed for bloodletting using a heparinized saline solution (12,500 units of heparin in 200 ml of 0.9% normal saline), there was a significant improvement in blood circulation.

3.5. Nursing care for pain management

Postoperative pain can easily precipitate vascular crises in microsurgically sutured vessels. Therefore, accurate pain assessment is crucial [6]. A multimodal approach to pain management should be adopted to enhance analgesia, aiming for effective pain control [7].

3.6. Positioning and environmental management

The patient was positioned supine to prevent compression of the affected limb, which could compromise blood circulation in the replanted fingers [8]. Smoking was strictly prohibited in the indoor environment to prevent nicotine-induced stimulation and subsequent spasm of local blood vessels, thereby averting the risk of vascular

crisis [9]. Local warming measures were applied to the affected limb to reduce the risk of vascular spasm induced by low-temperature stimulation.

3.7. Psychological nursing

The Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) were utilized to conduct a comprehensive psychological assessment of the patient, facilitating the timely identification of any adverse psychological states [10]. Following this assessment, specialized psychological nursing interventions were implemented by designated "Sunshine Angels" (nurses trained in psychological care) to address the patient's specific psychological needs.

4. Discussion and analysis

The replantation of multiple fingers with multi-planar amputations presents significant technical challenges and operational complexities. The successful execution of replantation surgery involving 20 completely amputated segments across four fingers of a single hand, as demonstrated in this case, is particularly rare, posing exceptional demands on nursing care [11]. This case underscores the value of personalized nursing program in managing complex finger replantation through precise planning and the successful implementation of perioperative nursing strategies. By establishing a specialized nursing team and formulating tailored nursing plans, precise nursing assessments, vigilant condition monitoring, effective pain management, meticulous positioning management, and targeted psychological nursing interventions were implemented. These measures facilitated the timely identification and efficient management of vascular crises, thereby enhancing the survival rate of replanted digits and patient satisfaction. In this instance, following three weeks of rigorous medical treatment and nursing care, all 20 replanted segments of the patient's fingers exhibited excellent survival and intact functionality. This outcome serves as compelling evidence of the effectiveness and feasibility of personalized nursing plans in the perioperative care of complex fingers replantation.

5. Conclusion

The successful implementation of replantation surgery involving 20 completely amputated segments across four fingers of a single hand in this case, along with the patient's favorable postoperative recovery, not only validates the feasibility of microsurgical techniques in complex finger replantation but also emphasizes the critical role of personalized perioperative nursing care in ensuring optimal surgical outcomes. This case provides valuable insights into the perioperative nursing care associated with complex fingers replantation. Moving forward, it is essential to further optimize nursing pathways and strengthen multidisciplinary collaboration to enhance the overall quality of nursing care and facilitate the patient's prompt recovery.

Disclosure statement

The authors declare no conflict of interest.

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