

# Experience of Multidisciplinary Care of a Ruptured Pseudoaneurysm with Complex Arteriovenous Fistula

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**Abstract:** This article summarized the multidisciplinary nursing experience of a patient with a ruptured pseudoaneurysm combined with complex arteriovenous fistula, including the establishment of a multidisciplinary nursing team, the development and implementation of first-aid, surgery, nephrology, hemodialysis room, perioperative, vacuum sealing drainage, (VSD), free flap transplantation, percutaneous jugular puncture and catheterization and hemodialysis. This is a successful exploration of nursing experience. Under the cooperation and joint efforts of medical treatment, nursing care, patients and family members, the patient was successfully treated and discharged with satisfaction.

**Keywords:** Pseudoaneurysm; Rupture; Multidisciplinary Care

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## 1. Introduction

Autologous arteriovenous fistula (arteriovenous fistula, AVF) is the most mature and commonly used vascular access route in hemodialysis in patients with end-stage renal disease. However, after a long-term and repeated puncturation, many complications can be combined, occurring in about 2~10% of autologous AVF<sup>[1]</sup>. When there is venous outflow tract stenosis or thrombosis or infection within the lumen, the aneurysmal body can increase progressively, and the aneurysmal wall will be repeatedly stimulated by inflammation and pressure, and tissue necrosis will occur, and even lead to skin damage, rupture of the pseudoaneurysm and massive bleeding. Although the clinical incidence of autologous AVF pseudoaneurysm rupture and bleeding is not high, if it is not treated in time, it may cause serious consequences or even death. Relevant data in the United States show that the fatal cases of vascular access related hemorrhage accounted for about 0.4% of the total deaths of the dialysis population, among which 11.3% deaths from spontaneous rupture of aneurysm or pseudoaneurysm accounted for 11.3%. Meanwhile, a retrospective study showed that 81% of fistula-related bleeding occurred out of hospital with mortality of around 44%<sup>[2]</sup>. Therefore, emergency effective treatment, is to prevent AVF pseudoaneurysm rupture, reduce the mortality, however patients with autologous AVF pseudoaneurysm usually suffer from severe renal failure, and other comorbidities, such as diabetes, hypertension, severe anemia, arteriosclerosis and other diseases, brought more difficulty to the diagnosis and treatment. Therefore, the treatment and nursing of AVF pseudoaneurysm often need the participation of first aid, surgery, nephrology, hemodialysis room and other multi-disciplinary departments, with the multi-disciplinary diagnosis and treatment mode, to bring patients more effective, safe and comfortable treatment experience and effect.

In March 2022, a patient with complex AVF pseudoaneurysm rupture was admitted to our department. After comprehensive treatment and multidisciplinary care such as first aid, specialized surgery and hemodialysis, the patient was successfully cured and discharged from hospital with satisfactory. The multidisciplinary nursing experience is now reported as follows.

## 2. Clinical data

### 2.1 General information

A 49-year-old male patient was admitted to the emergency department for "massive hemorrhage of ruptured AVF pseudoaneurysm of the left wrist for 2h". The patient underwent left wrist autologous AVF plasty 14 years ago for

hemodialysis treatment of chronic renal failure. Four years ago, the pseudoaneurysm of the anastomotic artery appeared with progressive enlargement and obvious pain two weeks ago. Physical examination: the pseudoaneurysm on the left wrist was pressurized with gauze, showing continuous bleeding, the aneurysmal size was 8cm\*5cm\*2cm, the skin on top was black and necrotic, the anastomotic tremor was weakened, and the ulnar artery was palpable.

## **2.2 Treatment and outcome**

After admission, the patient underwent emergency AVF pseudoaneurysm resection, radial artery and cephalic vein ligation, and semi-permanent tube implantation of the right internal jugular vein to maintain hemodialysis. After 4 days, the incision tension of the left wrist did not relieve, and the incision healing was poor. After removing the suture, vacuum sealing drainage, (VSD) was applied for 2 weeks. When the wound conditions turned good, the left forearm chronic wound expansion + free skin sheet transplantation (wound 10cm 2cm, left thigh skin) were conducted. The wound was healed on the 21st day.

## **3. Nursing**

### **3.1 Composition and responsibilities of the multidisciplinary nursing team**

Establishment of a multi-disciplinary nursing team, including head nurse of vascular surgery, responsible nurses of vascular surgery, attending physicians of vascular surgery, hemodialysis nurses, orthopedic nurses, nutritionists, and psychotherapists. All professional medical staff have obtained their professional practice certificate. This nursing team covers the perioperative nursing specialties of patients with AVF pseudoaneurysm, with fixed members and is competent for routine care. However, considering the particularity of the patient's condition, when necessary, specialists of nephrology departments, cardiology departments and emergency departments are needed to be flexibly deployed to deal with all kinds of emergencies.

Responsibilities head nurse of vascular surgery serves as coordinator, responsible for the coordination and communication of the multidisciplinary members, At the same time, the implementation of the nursing program is supervised. The vascular surgical responsibility nurse was responsible for the case reporting, summarize the problems need to be solved, record the nursing implementation programs developed through a multidisciplinary collaboration. The attending vascular surgeon assists the nurse in developing an individualized care plan, guiding patients on medication, communicate with the patient on procedure-related issues. Nephrology physicians based on the evaluation results of the perioperative patients, reconstruction of vascular access, and timely adjustment of the hemodialysis schedule. The hemodialysis specialist nurse is responsible for the completion of hemodialysis care and semi-permanent tube implantation of the internal jugular vein. The orthopedic nurse is responsible for guiding the care of free skin film after transplantation. The dietitian is responsible for assessing the nutritional needs of hemodialysis patients and formulating nutritional packages. Psychotherapists are responsible for the psychological interventions for patients and families, improve the bad mood of patients and their families.

### **3.2 Specialized care in vascular surgery**

#### **3.2.1 Emergency hemostasis care**

The rupture of pseudoaneurysm of arteriovenous fistula is generally arterial bleeding, turbulent, and even life-threatening, bleeding. Rapid, effective and safe hemostasis measures should be given. Therefore, after patient admission, the first step is to evaluate the risk of bleeding and whether the current method of hemostasis is effective and safe. In emergency situations, finger compression can be applied first to the anastomosis site<sup>[3]</sup>. However, due to the occupying effect of pseudoaneurysm, and the large amount of clots and necrotic substances in the aneurysmal cavity, local compression is difficult to apply and easy to cause pain, and the hemostasis effect is often poor. For example, in the patient mentioned in the article, the pseudoaneurysm was ruptured, the gauze of the left wrist pseudoaneurysm was pressurized and bandaged, and the bleeding continued with the dressing. Our experience is that after choosing the finger pressure method to control bleeding,

the pneumatic tourniquet is continued, and the red marker band is placed, and the time and frequency of hemostasis are recorded, and the tourniquet is released at 1 h for 15 min, and attention should be paid to avoid limb ischemia and necrosis caused by long-term hemostasis. For patients with no bleeding, the base area of the aneurysm should be marked, inspection should be strengthened, the changes of the size of the pseudoaneurysm should be closely observed, and the pneumatic tourniquet and sphygmomanometer should be placed beside the bed. Hemostatic measures should be applied in advance according to the symptoms of the patients, such as the sudden aggravation of the pain of the pseudoaneurysm.

### **3.2.2 Preoperative preparation**

Cooperate with the doctors to quickly complete the general preoperative evaluation, preoperative examination and necessary specialized auxiliary examination (such as imaging examination of arteriovenous fistula). Patients with uremia should be given necessary supportive treatment to correct the anemia status. At the same time, the patient or their family members are informed of the current condition, the necessity of the operation and the possible risks, calm the mood, eliminate the patient's fear, and complete the preoperative preparation work.

### **3.2.3 Postoperative observation**

According to the surgical situation, formulate individualized postoperative nursing measures, strengthen postoperative inspection, pay attention to distal peripheral blood supply, edema and dressing infiltration, so as to avoid or timely detect emergency situations such as distal ischemic necrosis, reperfusion injury and further bleeding. In principle, the affected limb should be straightened and elevated, the supine position should be raised about 30°, and the standing position should be suspended, making the wound surface above the heart level, to promote venous reflux, and reduce edema in the surgical area and distal end. Pay close attention to the upper limb sensory and motor recovery, early detection of nerve injury and other complications. At the same time, patients were advised to do fist clenched exercises as soon as possible to promote venous return. Two to 3 days after the operation, when the patient's condition is stable, it is necessary to strengthen the incision care, keep the incision dry and clean, observe the healing of the incision, if there is local skin redness, swelling, pain, fever or purulent secretions, report to the doctor in time.

## **3.3 Multidisciplinary nursing collaboration**

### **3.3.1 Nursing of VSD**

After resection of a giant pseudoaneurysm, the incision suture tension is large, with the possibility of poor incision healing and secondary skin graft of the wound. The wound sustained was wound on the fourth postoperative day due to high wound tension. The recommended pressure value of other chronic ulcers in adults with negative pressure treatment is -120~-70mmHg<sup>[4]</sup>. Under the cooperation of plastic nurses, the nurses followed the general special nursing content of VSD. The patient is discharged from the negative pressure to the hemodialysis room for dialysis, so the aseptic care of the connecting line of the VSD is particularly important. Our experience is as follows. First, VSD should be strictly sterile and airtight, full film wrap, pipeline reserved appropriate length. Second, close the buckle first, then close the negative pressure, remove the connecting tube with alcohol, and thoroughly wrap and fix with sterile gauze. Finally, after the patient returns to the ward, disinfect the connecting pipe, open the negative pressure first, then open the buckle, and observe and confirm the air tightness. When VSD is treated for 2 weeks, the orthopedic surgeon evaluates the wound and assists with preoperative preparation for skin grafting or flap surgery.

### **3.3.2 Postoperative care of free skin sheet transplantation**

Free flap operation is difficult and invasive, and perioperative complications are frequent. Good perioperative nursing measures are of great significance to the success of the operation<sup>[5]</sup>. In accordance with the general nursing principle after free skin grafting, plastic surgery nurses cooperate to develop special nursing content. Require the patient to lie on their back and raise the affected limb above heart level, which is conducive to blood return, reduce edema and pain. Vascular crisis of free flap is the most common factor leading to surgical failure, and the observation of postoperative flap transfusion is the

most important part of postoperative care. The peripheral blood transport of patients should be closely observed, with the frequency observed once every hour within 24h after surgery, once every 2 h for 24 to 48 h after surgery, not once within 6 hours after 48 to 72 h after surgery, and shift by shift. The nutrition department to promote wound healing.

### **3.3.3 Nursing care of semi-permanent tube and hemodialysis of the internal jugular vein**

The patient still needs postoperative hemodialysis maintenance therapy, and the Renal Outcome Quality Initiative (KDOQI) guidelines recommend the "patient first" vascular approach<sup>[6]</sup>. The patient did not have an ipsilateral internal fistula formation due to more necrotic hematoma in the ipsilateral pseudoaneurysm. Lawson class<sup>[7]</sup>It is pointed out that 10% of uremic patients in China use the central venous catheter as a dialysis access system, and the central venous catheter is the only access system for patients with no effective arteriovenous fistula. Therefore, the semi-permanent tube implantation of the right internal jugular vein, the standardized operation of nurses and the effective health education for patients are important links to extend the service life of the semi-permanent central venous catheterization. In coordination with the hemodialysis room, educate and guide before catheterization, and instruct patients to avoid strenuous exercise; During the dialysis treatment, the nursing staff shall follow the operation procedures, fully understand the condition, test indicators, treatment orders, evaluate the access conditions, closely observe the occurrence of blood coagulation, vital signs, access and surgical incision, etc. Anticoagulation drugs are needed in hemodialysis. Therefore, it is particularly important to pay more attention to local skin wounds and connect them with ward care. During the interval of pipeline use, the ward nurse should take intervention measures to prevent pipeline prolapse or distortion, pay attention to the puncture point, and change and flush the pipe regularly.

### **3.3.4 Psychological nursing care**

Psychological counselors make nursing plans according to the situation of patients, participate in the whole process of psychological counseling. Show the preoperative and postoperative photos of the cured patients, briefly describe the surgical procedure and postoperative effects, and clarify the possible complications and solutions. The focus solution short-term psychological nursing model is a psychological treatment model developed under positive psychology to respect individuals, believe in individual strength, advantages and potential, and is a psychological intervention process based on solving problems together with patients. It has the characteristics of short intervention period, good effect and easy implementation, and has a better effect in improving the adverse psychological conditions of patients<sup>[8]</sup>. Psychological counselors should focus on the postoperative, hemodialysis and other special periods, reduce patients' anxiety, fear and other bad emotions, establish confidence.

## **3.4 Prevention and care of complications**

### **3.4.1 Bleeding**

Because patients with renal failure have their own coagulation dysfunction and the need for heparinization during hemodialysis, the probability of wound bleeding is higher than that of ordinary patients. *The Clinical Practice Guidelines for Hemodialysis* recommend anticoagulation therapy to prevent the formation of blood clots in filtration devices and in vitro pathways. Low molecular weight heparin has become a commonly used anticoagulant drug due to its convenient administration and good biocompatibility, but when the risk of bleeding increases in patients, anticoagulant therapy should be stopped or reduced as soon as possible<sup>[9]</sup>. Postoperative care should pay close attention to the wound surface, and continue to strengthen the observation of the bleeding condition of the wound dressing.

### **3.4.2 Infection**

Patients with chronic renal failure have low body resistance and are more prone to infection than ordinary patients. Low body resistance increases the wound infection rate, and the risk of suture blood vessel rupture and bleeding is also greatly increased. In addition to hand hygiene and strict aseptic operation, medical staff should also pay attention to the patient's

temperature change and wounds. In this article, the patient recovered well with no wound and catheterization infection.

## 4. Summary

The incidence of AVF-related pseudoaneurysm is not high, but because of the hemodialysis access occupancy and neglect, it easily leads to the delay of diagnosis and treatment of AVF-related pseudoaneurysm, ending up with disease progression, repeated necrosis, destruction of aneurysmal wall, etc. For the diagnosis and treatment of AVF pseudoaneurysm, it is often necessary to develop comprehensive and individualized treatment and nursing plans according to the specific situation of individuals. At present, the nursing mode of the major hospitals in China has gradually developed from the traditional decentralized nursing to the high-quality nursing direction. This nursing mode advocates scientific management, paying attention to nursing quality and multidisciplinary team nursing concept, taking the individualized needs of patients as the guidance, and the division of labor and cooperation among team members, so that patients can get personalized, whole-process and professional nursing. In the paper, under the multi-disciplinary cooperation, the multidisciplinary team put forward suitable patient treatment and nursing programs and implemented them together. The patient received timely treatment and discharged with satisfaction.

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