



Case Report

A case of nursing care for multiple serious injuries causing femoral artery, vein rupture and nerve injury

Accepted

ABSTRACT

The aim of this present study is to summarize the clinical nursing experience of one case of multiple severe injuries resulting in femoral artery and vein rupture and nerve injury. A patient with severe multiple trauma shock was rushed to the hospital and received treatment from emergency personnels and specialists in combination with effective emergency treatment. After the emergency green channel for surgical intervention, post-operative close observation, shock resistance, resistance to infection, wound nursing catheters, pain management, antithrombotic nursing, and functional exercise rehabilitation specialist care were administered. After 30 days, the patient was discharged successfully. The patient was capable of self-care and was able to walk on crutches. Three months after discharge, he was able to take care of himself and resumed normal walking and exercise. Effective multi-disciplinary team cooperation, timely and effective capacity expansion and shock resistance, rapid and accurate surgery and early path-based functional exercise were keys to the successful rescue and comprehensive recovery of this patient.

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INTRODUCTION

With changes in society and the improvement of living standards, people's social activities have increased, and problems in communication are also increasingly prominent. When conflicts occur, some viewpoint of ideological quality is low. The law is weak, and knives are often used to carry out violent crimes; consequently, there has been an increase in knife injuries. Knife cuts due to accidental injury have a broader degree of damage; the damage due to the injury is complex, often involving serious damage to vessels, nerves, muscles and limbs, thus causing the body to lose a substantial amount of effective circulating blood volume, and possibly resulting in cell metabolism disorders and organ damage (Grubbs et al., 2019; Albanese et al., 2019) as well as, uncontrolled hemorrhagic shock. Secondary damage, respiratory center and neural paralysis, respiratory function and circulation failure, and even death may occur for the reason that the process of emergency handling is difficult. Therefore, correct and timely anti-shock treatment, precise surgery and high-quality

professional care play key roles in the treatment process.

In March, 2018, our department admitted and treated a patient with serious multiple injuries resulting in femoral artery and vein rupture and nerve injury. After timely and efficient emergency treatment, surgical intervention and meticulous perioperative care, the patient recovered.

CLINICAL DATA

A male, 23 years old, experienced multiple stab wounds resulting in hemorrhagic shock, left femoral artery and femoral vein rupture, left sciatic nerve rupture, fracture of the left biceps and deep brachial muscle, rupture of the left thigh deep muscle group, and abdominal perforation. He was rushed to the hospital by 120 on March 5th, 2018 and presented with right thigh contusion and laceration. The orthopedic team arrived at the emergency room 10 min before the 120 arrival time and waited with the EMTs. As

soon as the patient was admitted to the hospital, he received a red wrist band and specialist rescue. Within 20 min, the patient was sent to the operating room by the emergency green channel and under general anesthesia, repair of femoral artery and deep femoral vein rupture, exploratory laparotomy, left upper limb tendon anastomosis, and sciatic nerve repair were performed. The operation proceeded smoothly, with the backward, dynamic monitoring of vital signs, oxygen, shock resistance, resistance to infection and nerve repair closely observed. The patient received nutritional support, such as antithrombotic therapy care at the same time, which was supplemented with psychological nursing and physical therapy. After 30 days, the limb muscle strength had returned to normal, the wound had healed well, the patient was able to perform his own activities, and was discharged from the hospital. Three follow-up visits were conducted in January, March and June after the discharge. At 6 months, the patient was self-supporting and had no complaints of discomfort.

CARE

Pre-operative emergency care

On admission, the patient was in a coma with bilateral isobaric eyes 4.5 mm and a slow light response, and had pale, cyanotic lips and cold limbs. Physical examination revealed the following: T35.5°C, no P, BP, and weak respiration. Active bleeding was observed in a 5 cm wound on the left forearm, a 5 cm wound on the left lower abdomen and 17 cm×5 cm wound through the left lower limb. Multiple contusions and lacerations were present on the right lower limb. The left upper limb radial artery, left foot dorsal artery, and tibial posterior artery pulsation could not be reached, and the limbs were wet and cold. Right upper limb vein access was established. Hess dilation was performed for emergency blood preparation. At the same time, the clothes were cut off, a tourniquet was applied to the left leg, and a sterile cotton pad applied to cover the wound.

Transport care

The preparation and inspection of first aid medical equipment and other life support facilities should be improved. The elevator, janitor, and operating room staffs should be informed of the requirements of waiting. Before leaving the emergency room, the patient should be re-evaluated, the preparation of each pipeline and first-aid equipment and drugs the way should be checked, and the objective data of the patient recorded in detail. After completion, a doctor, paramedic and emergency room staff from the professional orthopedic group should accompany the patient during the entire journey. At 16:00, the patient should arrive at the operating room through the emergency

green channel, all handover should be performed according to the SBAR communication process, and emergency surgery conducted. During the operation, 1200 ml of suspended white blood cells and 750 ml of plasma should be injected. The operation went smoothly, lasting for 4 h and 30 min.

POST-OPERATIVE CARE

General post-operative care

Postoperatively, in the orthopedic ward in critical care, the following were observed: bedside ECG monitoring (vital signs monitoring tip: temperature 35.8°C, heart rate 140%, breathing 24 times per minute, blood pressure 90/55 mmHg, blood oxygen saturation, 96%), zhao qing, large and circular pupil at both sides with a diameter of 2.5 mm, light responsive, left arm, abdomen and left lower limb dressings dry. The affected limb was cushioned 20 to 30° and bent 5°. The muscle strength of the left upper extremity was rated as grade 4, while the muscle strength of the left lower extremity was rated as grade 0, and the muscle strength of the right lower extremity rated as grade 3. Low-flow oxygen was given at 3 L/min, and the vital signs, wound dressing, arterial pulse, peripheral blood circulation, skin temperature and sensory movement were observed every hour. Immediately after the operation, the patient was assisted in foot passive back plantar flexion and upper and lower limb muscle massage, and ECG monitoring ceased on the 2nd day after the operation.

Monitoring blood changes, observing blood transfusion and drug reactions, assisting in regular changes in body position, patting the back for 2 h at a time and encouraging respiratory exercise were performed by post-operative oral and perineal nursing staffs twice per day. On the 10th day after the operation, the nurse assisted the patient in sitting up, getting out of bed and standing beside the bed.

Anti-shock nursing

The shock position was adopted in the concave position, with the head raised 15°, the lower limbs raised 20° and the head tilted to one side. The two methods used to restore the right upper limb and right jugular vein after surgery were 500 ml hydroxethyl starch (40 drops/min) and suspended LBCS (1.5U) and 40 drops/min. After the patient returned to the room, the vital signs were closely monitored, and the patient's respiratory rate, pulse, blood pressure and consciousness carefully observed. Thereafter, accurate recording of 24-h urine volume and control of fluid balance were performed, and laboratory results, particularly changes in hemoglobin and the red blood cell count were examined. The patient was covered with a quilt to keep warm. At 08:00 on March 6th, T36.3°C, HR 98 times/min, bp100/66 mmhg,

R18 times/min, SP_{O_2} 98%, hematocrit: 0.21, hemoglobin: 68 g/L, erythrocyte count: $2.30 \times 10^{12}/L$, coagulation report: thrombolytic time: 20.4 s, d-dimer: 1.15 $\mu g/ml$ and fibrinogen concentration: 1.15 g/L were observed. Anemia correction was performed with 1.5u of small white erythrocytes, and 350 ml supplementary coagulation factor was administered. On March 7th, 1.5u + 175 ml plasma with suspended LBCS was injected again. Meanwhile, the amount of input and output was to maintain a positive balance in the amount of input (Lamb et al, 2018); changes in body temperature were monitored, and the reaction after a large number of blood transfusions was observed. The patient's vital signs were stable, and the measurements were $T36.9^{\circ}C$, P88 times/min, R17 times/min, bp117/61 mmhg, and SP_{O_2} 98%. ECG monitoring and oxygen were discontinued. Reexamination on March 10th showed that the hematocrit was 0.21, the hemoglobin was 80 g/L, and the red blood cell count was $3.14 \times 10^{12}/L$.

Wound and catheter care

The post-operative abdominal and limb wound dressing were clean. The left upper limb radial artery pulsed significantly, the left lower limb dorsal foot artery could be touched, the popliteal artery pulsed, the peripheral blood supply was normal, and the skin temperature was slightly cold. The dressings were kept clean and dry after the operation, and the limb color, temperature, sensation, arterial pulse and peripheral blood supply were closely observed. Attention was paid to the catheter to ensure that it was clearly marked and kept unobstructed and properly fixed to observe the color, quality and quantity of drainage fluid, to avoid distortion, folding and obstruction of the tube when turning over, and to check and record every shift correctly. Strict aseptic principles and standard procedures were followed when draining liquid was discarded. On March 8th, the abdominal cavity and left lower extremity drainage tube were successfully removed, and the dressing was clean.

Pain care

According to the principle of painless wards, pain was scored by the NRS method. When the pain score was ≥ 5 , the analgesic desorcline injection 2 mg was added to 100 ml normal saline intravenous infusion/QD to relieve postoperative pain. In addition, local massage, talking with family members, listening to music and other strategies were adopted to distract the patient and relieve the pain (Konesky and Guo, 2018). The effect was obvious during the day, and the pain relieved. At night, 15 mg etazocine hydrobromide injection was given, as prescribed by the doctor, and the pain was alleviated to enable the patient observe some rest and sleep.

Prevention of deep vein thrombosis

Because they remain in bed for a long time, patients performing limited activities have a slow blood flow, and trauma may cause hemal wall damage, while patients may be prone to lower extremity deep vein thrombosis. But as a result of uncontrolled hemorrhagic shock patients, we through the screening rating of deep vein thrombosis, monitoring blood coagulation, routine blood, and D dimer index, gives the basic prevention, guiding patients daily drinking water 2000 ml, early postoperative functional exercise, static contraction of the quadriceps thrice per day in every 15 min, improve the blood circulation in patients with lower limb using the rings of the head of a bed at the same time, exercise the upper arm muscle strength, and prevention of deep vein thrombosis (Niemi-Nikkola et al, 2018).

Rehabilitation exercise

Path-based rehabilitation function exercise was carried out by nurses. Bedside assistance and guidance were given during the hospital stay, and nursing guidance continued after discharge.

Evaluation of nerve function

The patient injured the sciatic nerve with penetration of the deep femoris muscle group, thus, resulting in sciatic nerve rupture and common peroneal nerve injury. The patient showed prolapse of the left leg, an inability to extend the back of the toes, an inability to walk normally with the heel, paralysis of the innervated muscles, and loss of muscle tension. At the time of admission, there was no pulsation in the dorsal artery of the left lower extremity, and the muscle strength was grade 0. The nerve function was assessed, and the sensory sensation, pain sensation, and movement sensation of the foot were observed to be absent through touch and directional force. On the third day after the operation, the left lower extremity dorsal artery pulse could be felt, the touch and pain sensation had recovered, and the muscle strength was grade 1. After extensive functional exercise, the muscle strength of the left lower extremity had recovered to grade 3 on the 10th day after the operation, the sensory and motor functions had been restored, and standing next to the bed could be performed with assistance.

Targeted functional exercise

Targeted functional exercise includes the following:

(1) Upper limb training: 0 to 2 weeks after the operation (after waking up under anesthesia), the affected finger was

clenched, and balanced abduction training was performed, for 5 s continuously, 20 times and thrice per day. Two weeks after the operation, passive lateral outward rotation began; the flexion was 90° and was maintained for 2 min, four times per group, two groups per day. At 6 to 12 weeks after the operation, isometric muscle strength contraction exercises were conducted, mainly with the assistance of active training of shoulder and elbow joints. At 12 weeks after the operation, resistance training was carried out: the upper body was lifted with both hands using a sling, and the upper body was lowered after 5 to 10 s, 30 times per day, at 30 groups per time to avoid fatigue.

(2) Lower extremity training: To promote blood circulation of the affected limb, reduce swelling of the affected limb and promote wound healing immediately after the operation, passive activity of both ankles, calf and foot massage, flexion and extension of ankle joints and anti-resistance activities, and contraction of quadriceps etc were performed. Because of the penetrating injury, the rupture of the left thigh deep muscle group, the skin contusion and tearing of the right lower limb, and rupture of the left femoral artery and vein, we considered that contraction of the quadriceps might cause increased blood loss. Consequently, the active exercise of the right lower limb was gradually performed. The left lower extremity performed mainly passive movement. For two consecutive days 30 min after meal, low slope, the right lower limb exercise quadriceps contraction, and hand feel was made valid by means of the thigh muscle contraction, which lasted for 5 s, followed by relaxation for the first time in 17 times, feeling ache after giving up, with the second line being 22, the third line 11 times one step after the other, until the 7th post-operative day, where right lower extremity was completed 100 times per day for three to four times. In passive functional exercise, the left leg line was performed with the assistance of nursing staffs and family members with ankle pump movement and foot massage for 10 days and the left leg muscle strength back to level 3 (sensorimotor function), can under the guidance undergo quadriceps exercises and ankle pump movement actively, but due to weak strength at discharge can be done 80 times per day.

(3) Respiratory function training: The patient was guided to expand the chest movement and increase lung capacity, thrice per day in 30 groups per time. At the same time, with deep breathing to produce effective cough sputum, the back was patted thrice per day to promote the discharge of lung secretion and prevent the occurrence of pneumonia.

Psychological and dietary care

Because the patient was in a coma when he was admitted to the hospital for emergency treatment, and he was young and middle-aged, he could not bear the loss of limb function after the operation. He had initially experienced fear and negative

emotions. To understand the thoughts of the patient and conduct positive psychological counseling, a nurse was always at the patient's bedside to communicate with the patient thrice per day. In addition, through an understanding, all medical expenses related to this incident were borne by the party responsible for the accident, so that the patient could consider the expenses, receive treatment, actively cooperate in the rehabilitation exercises, and have hope for his future life (Kavaja et al., 2018). The patient was given highly nutritive, high protein, vitamin-rich food, such as fish, bone soup, leek, celery, banana, and pitaya, etc. He drank 2000 to 2500 ml of water per day. Abdominal clockwise massage was performed 100 times/day, and the patient was guided in anal sphincter contraction exercise thrice daily in 30 groups intermittently to develop regular bowel movement habits.

The patient had multiple knife wounds combined with traumatic shock, and his condition was highly critical (Torres-Berrio and Nava-Mesa, 2019). He was admitted to the hospital at 120 and received emergency treatment in combination with the specialized group. He was admitted to the operating room through the emergency green channel, and received golden surgery treatment.

The key points for the successful treatment and comprehensive recovery of this case were as follows:

(1) The full cooperation and accurate judgment of the multidisciplinary team ensured the effective implementation of first aid quality and life support. For critical injuries, timely and effective capacity expansion, hemostasis, anti-shock treatment, maintenance of respiratory circulation, and rapid precision surgery are key to success in saving patients' lives;

(2) Patients with several open wounds, nerve and blood vessel rupture, shock, and low immune function require increased time and effort in surgery and are more prone to infection. To ensure smooth cross infection after surgery, the surgical team must have a tacit understanding, must be skilled, must choose effective antibiotics postoperatively, strengthen nutritional and metabolic support, and protect the function of important viscera and the immune system, such as through observing the peripheral blood supply of the injured limb, feeling, wound, and drainage tube, etc to determine the presence of hemorrhage and blood loss, assess signs of infection, perform dynamic monitoring of body temperature and changes in routine blood parameters; and effectively prevent postoperative infection;

(3) Early pathway rehabilitation function exercise cannot only increase local blood circulation and prevent lower extremity deep vein thrombosis, but also increase muscle strength and promote the recovery of joints, nerves and limb function.

There is pessimism about the future life of the patients in

this case patients after surgery and mental pressure, and beds nurse is comfort for the patient to communicate, but psychotherapy professional knowledge, such as to meet such patients is not enough, hence, there is need for psychological outpatient service consultants, professional advice and opinions to enhance the patient confidence and courage to face a better life.

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