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Nursing Experience on Preventing Blood Reflux After Indwelling Needle Insertion in a Gangrene Patient (Postprint)

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Abstract

This article summarizes the nursing experience of preventing blood reflux following indwelling needle placement in one patient with external gangrene, encompassing preventive measures such as risk factor assessment, standardized operation, selection of appropriate puncture sites, catheter sealing methods, choice of sealing solution, and health education. Through scientific preventive measures, blood reflux after indwelling needle placement was effectively prevented, thereby enhancing the clinical therapeutic efficacy of indwelling needles.

Full Text

Preamble

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Nursing Experience in Preventing Blood Return After Indwelling Needle Placement in a Gangrene Patient: A Case Report

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Abstract

This paper summarizes the nursing experience in preventing blood return after indwelling needle placement in a gangrene patient. Key preventive measures include risk factor assessment, standardized procedures, appropriate puncture

site selection, tube-sealing methods, selection of sealing solutions, and health education. Through scientific preventive measures, blood return after indwelling needle placement can be effectively avoided, thereby improving the clinical therapeutic effect of indwelling needles.

Keywords: gangrene; intravenous indwelling needle; blood return; heparin; thrombus; health education

Introduction

Gangrene refers to a chronic peripheral vascular disease caused by vascular occlusion in the extremities leading to necrosis. It can result in thickened arterial intima, causing luminal narrowing or occlusion. Insufficient distal blood supply easily leads to peripheral venous narrowing, triggering venous arterialization. Furthermore, indwelling needle placement further reduces vascular diameter and impedes blood flow. After blood return in the indwelling needle, thrombus may form within the needle lumen and intravascularly. This paper reports the nursing experience in preventing blood return after indwelling needle placement in one gangrene patient.

Clinical Data

The patient was a male, aged years, admitted to the hospital in a wheelchair for further diagnosis and treatment with the chief complaint of “elevated blood sugar for over years.” He was admitted to our department with the diagnosis of “gangrene with deficiency of vital qi and lingering pathogenic factors, diabetic foot gangrene complicated with infection.” Admission symptoms included: ulceration and pain at the right foot stump, limited flexion and extension of both lower legs, pain at the toe stump, coldness, numbness, and weakness of lower limbs, chest tightness and shortness of breath that worsened with activity, and intermittent abdominal pain. Laboratory tests showed: lymphocyte %, neutrophil percentage %, red blood cell count 12/L, hemoglobin content g/L, hematocrit %, platelet count 9/L, D-dimer (quantitative) g/mL, fibrinogen degradation products g/mL. Liver and kidney function: albumin g/L, glucose mmol/L, mol/L, uric acid mol/L. Stool routine + occult blood test on day showed positive occult blood (Hb). After admission, according to the patient’s treatment schedule, a peripheral venous short catheter was selected and a peripheral indwelling needle was placed to reduce patient suffering from repeated punctures and protect blood vessels. Medical orders included: intravenous drip of Gualoupi injection for promoting qi and relieving fullness, opening chest and relieving obstruction; intravenous drip of Danshen Duofensuan for activating blood circulation and removing blood stasis; intravenous cefotaxime g, twice daily for anti-infection treatment.

Risk Factor Assessment

Thrombosis Risk Factors Puncture Site: During vessel selection, nurses may fail to conduct adequate assessment and choose inappropriate locations, such as areas near joints or with high activity frequency (e.g., elbow fossa, wrist joints). When patients perform certain movements or bend the punctured limb, blood return is likely to occur.

Puncture Technique: Unskilled puncture technique may damage vascular endothelium, causing aggregation of coagulation factors and platelets, leading to blood return, catheter blockage, and thrombus formation.

Patient Factors Poor patient compliance and lack of attention to activity of the punctured limb, such as making large movements or lifting heavy objects, can increase venous pressure due to gravity and extravascular tissue pressure. When venous pressure exceeds the pressure in the extension tube, blood easily refluxes into the indwelling needle catheter.

Disease Factors Affected by the disease condition, blood vessel walls become stiff, lose elasticity, and cause luminal narrowing, resulting in slow blood flow and needle blood return or blood clots. When assessing catheter function, never forcefully flush the catheter to prevent pushing blood clots into blood vessels and causing thrombosis [5].

Preventive Nursing Interventions

Standardized Nursing Operations Puncture Site Selection: According to the *Infusion Therapy Standards of Practice* compiled by the Infusion Nurses Society (INS) in 2016, the forearm area can increase dwell time, reduce pain during indwelling period, facilitate nursing care, and prevent accidental dislodgement and thrombosis. Avoid the medial wrist, joints, and painful areas to prevent pain and radial nerve damage. For long-term bedridden patients, venous thrombosis occurs 4 times more frequently than arterial thrombosis, and lower extremity venous thrombosis occurs 9 times more frequently than upper extremity venous thrombosis. Unless necessary, lower extremity veins should be avoided to reduce risks of tissue damage, thromboembolism, and ulceration. Upper forearm placement is preferred. Related studies [6] indicate that indwelling needles placed in the upper forearm have the lowest blood return rate.

Stopcock Clamp (Lin-Hua Clamp) Position: The probability of blood return in intravenous indwelling needles is related to the clamp position of the stopcock (Lin-Hua clamp). When the clamp is closed near the puncture point, the blood return rate is lowest. When the Lin-Hua clamp closes the distal end of the extension tube, slight patient movement may cause blood reflux in the extension tube. Prolonged blood return time leads to thrombus formation within the catheter, affecting dwell time. Closing the clamp at a distance of

2-3 cm from the needle tip can effectively reduce blood return rate and catheter blockage, positively impacting patient comfort and extending dwell time.

Indwelling Needle Fixation: After puncture, fix the indwelling needle with transparent dressing without tension, centering on the puncture point. Then, align the extension tube parallel to the punctured vein, with the Y-connector facing outward and the heparin cap positioned higher than the puncture point, avoiding the venous course. Use a high-platform U-shaped fixation. The U-shaped fixation is based on the principle of communicators, allowing the sealing solution to remain static in the catheter with equal pressure on both sides. When the Lin-Hua clamp is closed, fluid in the catheter does not flow, reducing tissue pressure that causes blood to flow into the catheter. This can effectively reduce catheter blood return, blockage, and loosening, extending the service time of indwelling needles [11].

Selection of Sealing Solution Related studies [12] show that heparin sodium is more effective than normal saline in reducing blockage caused by blood return. Study [13] indicates that different concentrations of heparin sealing solution (10 U/ml, 50 U/ml, 100 U/ml, 125 U/ml) have no significant effect on bleeding tendency in elderly patients and patients with mild to moderate coagulation dysfunction due to liver cirrhosis. Xu Lei [14] reported no significant difference between normal saline and heparin sodium solution for intravenous indwelling needle sealing. Although normal saline has no anticoagulant effect, it can maintain extracellular fluid volume and osmotic pressure and salt balance in the body. Using appropriate amounts of normal saline can effectively prevent thrombosis. The choice of sealing solution should be individualized. Based on this patient's coagulation test results, low-concentration heparin sodium solution was used for sealing to prevent coagulation after blood return.

Sealing Method After infusion, use sterile normal saline for pulse flushing followed by positive pressure sealing. The flushing involves rapid injection for 1 second and pause for 1 second, repeated cyclically. When using slow injection for sealing, slowly inject the sealing solution without completely emptying the syringe. Stop when 0.5-1 mL remains. The piston at the front end of the syringe is basically made of rubber, which has elasticity. Pushing to the bottom creates slight negative pressure, causing blood reflux into the catheter and blockage. While injecting sealing solution, slowly withdraw the syringe to balance intravascular pressure with indwelling needle pressure, fill the soft tube with sealing solution, and prevent blood reflux [19]. Simultaneously, close the small clip near the root to avoid blood reflux and reduce blood return and blockage rates [20].

Sealing Equipment Anti-blockage safety positive pressure indwelling needles are relatively simpler and safer for clinical operation. They generate positive pressure when the infusion device is removed, automatically pushing fluid in the

connecting tube forward to effectively avoid blood reflux. Dual automatic positive pressure and threaded needle connections can reduce blood return blockage and infection. Compared with ordinary heparin cap indwelling needles, positive pressure connector indwelling needles can effectively reduce blood return in indwelling needles [21].

Health Education

Currently, indwelling needles are widely used clinically, and preventing blood return is an essential aspect. Health education is an important component of holistic nursing. Picture and video education can deepen patients' memory through visual and auditory senses more than basic oral explanation, helping patients understand relevant knowledge and preventive measures of intravenous indwelling needles, improving self-care ability, and saving medical resources [22]. The ward can set up indwelling needle health education bulletin boards and produce videos on precautions during indwelling needle retention period in plain language for patients [23], instructing patients not to scratch or expose to moisture, to minimize limb movement at the puncture site, not to lift heavy objects, and to immediately notify nurses if loosening or moisture occurs.

Discussion

Elderly patients have severe tissue degeneration, poor compliance, and due to underlying diseases, poor vascular elasticity and stiffness, making them difficult to fix and prone to sliding. This increases puncture difficulty, affects dwell time and treatment effect, and carries high risk of thrombosis, seriously endangering patient safety [24]. Therefore, preventing micro-thrombosis is a necessary measure, and effective nursing intervention to reduce blood return is a pre-emptive control [25]. Blood return in intravenous indwelling needles is closely related to puncture site and various maintenance measures during indwelling period. Standardized nursing operations are the foundation for reducing blood return in intravenous indwelling needles. For patients with peripheral vascular disease and hypercoagulable state, using heparin sodium solution for sealing can reduce the risk of thrombus formation within the catheter lumen [26]. Health education is a necessary nursing measure. Popularizing relevant knowledge and improving patients' disease awareness can help reduce complications such as indwelling needle blood return, effectively avoid unplanned extubation, and improve nursing quality.

Conflict of Interest Statement: The authors declare no conflict of interest in this article.

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