International Journal of General Practice Nursing, 2025, Volume 3, Issue 2
https://ojs.bbwpublisher.com/index.php/IJGPN
ISSN Online: 2981-9423
ISSN Print: 2981-9415

Importance of Specialized Nursing Care in Adrenal Venous Sampling

Xianman Wang, Fengju Chen, Jianling Li, Zhonglan Gao, Xiaoge Zhong*

The First Affiliated Hospital of Guangxi Medical University, Nanning 530021, Guangxi, China

**Author to whom correspondence should be addressed.*

Abstract: *Objective:* To explore the key nursing points before, during, and after adrenal venous sampling. *Methods:* A total of 147 patients with primary aldosteronism (PA) underwent adrenal venous sampling (AVS) via catheter insertion through the elbow vein (median cubital vein, basilic vein, or cephalic vein) to determine the appropriate treatment plan. *Results:* 145 patients successfully completed AVS, while 2 patients failed in right adrenal venous sampling due to adrenal vein rupture and hematoma formation. Among the 147 patients, 121 were punctured through the median cubital vein, 10 through the cephalic vein, and 16 through the basilic vein. In 3 cases where the cephalic vein was initially punctured, the guidewire could not be inserted into the vein, requiring a switch to the basilic vein for successful insertion. *Conclusion:* Preoperative reasonable arrangement of operation time and strengthening of psychological nursing care, seamless cooperation with surgeons during the operation, and prioritizing puncture of the median cubital vein or basilic vein, with a puncture needle direction favoring the basilic vein during median cubital vein puncture, can significantly reduce operation time. This effectively avoids discomfort, such as back pain, caused by prolonged surgery. Postoperative observation of the patient's condition and specialized nursing care can effectively reduce the occurrence of complications.

Keywords: Primary aldosteronism; Adrenal venous sampling; Nursing care

Online publication: June 6, 2025

1. Introduction

Primary aldosteronism (PA) is caused by the continuous secretion of excess aldosterone by the adrenal cortex, leading to a significant increase in aldosterone levels and resulting in a syndrome. Its pathological manifestations include decreased plasma renin levels and increased plasma aldosterone levels, often accompanied by hypertension and hypokalemia, making the condition more complex [1]. Long-term exposure to high aldosterone levels in PA patients can cause related target organ damage and cardiovascular events such as atrial fibrillation, myocardial infarction, and stroke. Timely diagnosis and targeted treatment can reduce adverse events in PA patients and improve their quality of life [2–4]. Among the various subtypes of PA, idiopathic hyperaldosteronism (IHA) and

aldosterone-producing adenoma (APA) are the most common, with fundamentally different treatment principles. IHA patients are recommended lifelong oral aldosterone receptor blockers, while APA patients prioritize unilateral dominant gland surgery. Currently, both domestic and international guidelines and expert consensuses recommend adrenal venous sampling (AVS) as the gold standard for clinical diagnosis and functional classification of PA [1, 5–7]. AVS can accurately detect PA and is therefore frequently used. Combining meticulous and personalized nursing services can significantly improve the smoothness of AVS examination and has a positive mechanism for prognosis. Therefore, this study selected 147 PA patients who underwent AVS to evaluate the specific effects of nursing intervention.

2. Materials and methods

2.1. General information

A total of 147 patients with PA who were diagnosed and underwent adrenal venous sampling (AVS) at the Hypertension Department of The First Affiliated Hospital of Guangxi Medical University from July 2018 to September 2020 were selected. The general information and biochemical results of PA patients are shown in **Table 1**. An independent sample *t*-test was performed on the data of male and female groups using statistical software SPSS 22.0. The results showed that the BMI value of males was higher than that of females, which was statistically significant (P=0.008), while there was no statistical difference in other clinical data.

Table 1. General information and clinical data of 147 patients with PA

Project	Overall	Male	Female	*P* value
Number of cases	147	67	80	-
Age (years)	46.14 ± 10.48	46.72 ± 10.42	45.66 ± 10.5	0.547
BMI (kg/m^2)	24.15 ± 3.38	24.96 ± 3.13	23.47 ± 3.43	0.008
Systolic blood pressure (mmHg)	152.77 ± 18.91	150.57 ± 15.62	154.69 ± 21.18	0.195
Diastolic blood pressure (mmHg)	91.8 ± 14.55	90.7 ± 13.63	92.75 ± 15.25	0.402
Blood potassium (mmol/L)	3.29 ± 0.55	3.31 ± 0.50	3.45 ± 0.58	0.279
24-hour urinary potassium (mmol/L)	35.9 ± 17.73	38.4 ± 18.69	33.87 ± 16.63	0.158
Aldosterone concentration (pg/ml)	245.76 ± 191.55	250.32 ± 222.51	241.96 ± 161.1	0.795

Note: BMI: Body Mass Index; P <0.05 is statistically significant

2.2. Examination method

All PA patients underwent AVS examination in the catheterization laboratory of our hospital. The procedures were performed in the morning, assisting patients to complete various examination items, keeping them in a supine position on a trolley, and then transferring them to the catheterization laboratory. Doctors followed corresponding protocols to collect adrenal venous blood, which was then sent for testing to evaluate the specific concentration of cortisol and aldosterone content. After the procedure, the venous catheter sheath was removed directly, and reasonable hemostasis and compression were applied, and then the patient was transferred back to the ward.

3. Results

Among all patients, 145 cases successfully completed the entire examination process, while 2 cases failed to collect blood during the puncture of the right adrenal vein. Among them, 61 cases were diagnosed with idiopathic aldosteronism and treated with long-term oral medication; 84 cases were diagnosed with aldosterone adenoma, showing unilateral dominant secretion and adrenal CT suggesting ipsilateral nodules or adenomas, which were transferred to urology surgery after excluding surgical contraindications. None of the 145 patients developed complications such as adrenal vein rupture and bleeding, dissection, thrombosis, infarction, etc. However, in the 2 unsuccessful cases, adrenal vein rupture and hematoma formation occurred, manifesting as significant lumbosacral pain reported by the patients. During angiography, local retention of the contrast agent was observed, and the procedure was stopped to prevent further complications. **Figure 1** shows the complications of right adrenal vein rupture and hematoma formation in AVS patients.

Figure 1. Complication: Hematoma formation due to rupture of the right superior adrenal vein

4. Nursing care

4.1. Preoperative care

4.1.1. Routine preoperative preparation

Assist in completing various examinations and intermittently evaluate electrolyte values. If blood magnesium or potassium levels are low, leading to decreased myocardial excitability in patients, corrections need to be made. Ensure that patients have not used diuretics or nifedipine and other similar drugs for one month prior to surgery. One day before surgery, prepare for the procedure and conduct an iodine allergy test, carefully recording the results. Demonstrate bedpan use and have patients master the relevant training points. Instruct patients to defecate before entering the catheterization laboratory.

4.1.2. Special preoperative preparation

Adrenal venous blood sampling should be scheduled between 9:00 and 10:00 AM. Inform patients and their families of the importance of the surgery time for accurate test results, ensuring that family members are available on time. Patients should change into hospital gowns and empty their bladders ahead of time. Nurses should communicate with the catheterization laboratory and relevant medical staff beforehand to ensure timely surgery. Patients are required to lie flat and rest starting from 11 PM the night before surgery until they are transferred to the operating room. On the morning of the AVS examination, a nurse will perform a puncture on the right median cubital vein. If the median cubital vein cannot be punctured, the right basilic vein or right cephalic vein will be punctured instead. After a successful puncture, the needle will be secured, and patients will be instructed to keep their right upper limb straight. Figure 2 shows the results of the elbow vein puncture.

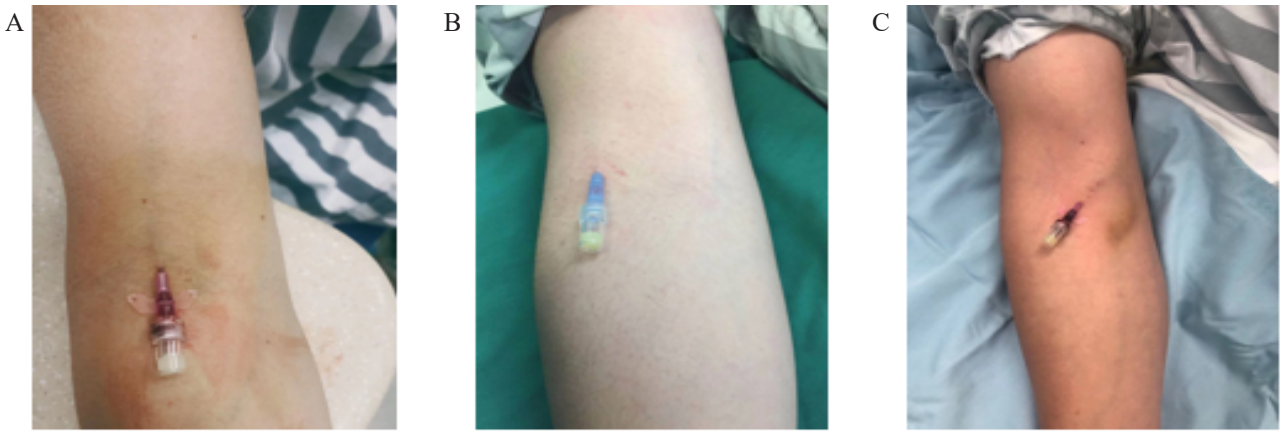

Figure 2. Indwelling needle condition for elbow blood vessel puncture. A. Median cubital vein (121 cases); B. Cephalic vein (10 cases); C. Basilic vein (16 cases)

4.1.3. Psychological care

Health education informs patients and their families about the minimally invasive, safe, and mature nature of the surgery and introduces interventional knowledge related to the surgery. Patients generally have a basic understanding of this technology, but when faced with complex and invasive procedures, their negative psychological state becomes more apparent. Therefore, it is necessary to combine knowledge education with manuals or videos explaining various knowledge points, such as the entire examination process, operating techniques, and cooperation methods, so that patients can efficiently cooperate with related operations, reasonably adjust their body positions, etc., and improve their understanding and awareness of the surgery.

4.2. Intraoperative care

4.2.1. Patient monitoring

Assist the patient to lie in a supine position, provide nasal cannula oxygen inhalation at 3L/min if necessary, closely observe vital signs, and keep records.

4.2.2. Adrenal vein blood sampling has high sensitivity and specificity

Surgeons place a catheter under the guidance of digital subtraction angiography (DSA), specifically in the inferior

vena cava, puncturing along the right median vein. Use a 5FJR5 catheter and moderately dilute the contrast agent iohexol, with a specific dose of 5 to 10 mL. After injection, observe the situation and wait for the liquid inside the catheter to slowly drip out, about 15–20 drops, to ensure that the blood is not diluted and the accuracy of the results. Then, the nurse takes at least 2 mL of blood from each part of the accurately checked test tube, detecting aldosterone and cortisol concentrations. Attention should be paid to aseptic operation during the blood collection process, and changes in the speed of blood dripping and patient movement should be monitored to avoid displacement of the catheter during the blood collection process. If necessary, it is recommended that the surgeon perform digital subtraction angiography (DSA) again to check whether the catheter has shifted position, ensuring accuracy before continuing blood collection. Abnormalities should be promptly reported to the physician and operator to stop the operation for rescue. In this study, there were 2 cases of right adrenal vein rupture and hematoma formation. The pain could be gradually relieved in 2–5 days after observation or analgesic treatment. Therefore, when the dedicated doctor injects the contrast agent, it should be pushed slowly. If the vein elasticity is relatively poor, and the course of hypertension is relatively long, the vein is relatively thin, then the pressure value during injection should be reduced to avoid rapid injection to prevent bleeding and other situations.

4.3. Postoperative care

4.3.1. Patient resting

After the patient is transferred to the ward, they are instructed to lie down for 1 hour. If there is no discomfort, they can try to sit up, then get out of bed as soon as possible. Strenuous exercise, fist clenching, and support movements are not allowed. Lifting heavy objects and bending the operative limb are prohibited, keeping it in a naturally relaxed state. Puncture the right median vein of the elbow to shorten the duration of immobilization or bed rest. For patients with complications, one case had a ruptured adrenal vein. After returning to the ward, an emergency bedside abdominal ultrasound was performed, and no hematoma was found. The patient felt moderate pain. Psychological comfort was provided, and the patient was monitored hourly for blood pressure. The pain could be relieved the next day. Another case had a ruptured adrenal vein with hematoma formation. The patient complained of severe pain and sweating. Symptomatic treatment with analgesic drugs was prescribed according to the doctor's advice, along with psychological comfort. The patient's blood pressure was measured every 30 minutes. After the pain was relieved, pain assessment and blood pressure measurement were performed every 6 hours. The patient's pain was completely relieved after 5 days. After surgery, each patient underwent pain assessment, and their blood pressure was regularly evaluated. Any abnormalities in the results need to be reported to the doctor immediately to maximize the prevention of adverse events and implement symptomatic treatment as soon as possible.

4.3.2. Patient monitoring

For patients who experience discomfort after the procedure, bedside electrocardiogram, blood pressure, and finger pulse oximetry monitoring should be conducted. Vital signs should be closely observed and recorded. If there are any abnormalities, doctors should be promptly notified. Hydration therapy should be administered, and patients should be advised to drink large amounts of water frequently, with a daily intake exceeding 1500 mL to prevent abdominal distension due to water intake. Intravenous fluid replacement can also be used to quickly clear the contrast agent from the body and prevent it from affecting renal function [7]. A bland diet with a focus on vegetables or high-protein foods is encouraged to accelerate the excretion of the contrast agent and effectively reduce the occurrence of contrast-induced nephropathy (CIN). Patient information such as age and renal function directly

affects their tolerance to contrast agents, so it is necessary to screen for adverse factors, increase the frequency of inspections, and promptly perform additional tests and treatments if there are abnormalities in multiple renal function indicators such as a significant reduction in urine output or elevated blood urea nitrogen levels, which may indicate concurrent renal toxicity.

5. Discussion

5.1. Procedure

AVS is recognized as the gold standard for diagnosing primary aldosteronism and performing functional classification, providing strong evidence for determining treatment plans for PA patients. In this study, it was observed that patients who underwent puncture of the median cubital vein or basilic vein could successfully insert the guidewire. However, a small number of patients who underwent cephalic vein puncture were unable to advance the guidewire into the vein, requiring a switch to basilic vein puncture during the procedure, which increased the examination time [8]. Additionally, when puncturing the median cubital vein, the direction of the puncture needle toward the basilic vein resulted in less time required for guidewire and catheter insertion compared to puncturing toward the cephalic vein. This difference was mainly due to reduced time spent on repeated adjustments of the guidewire and catheter directions. The reason for this may be that the basilic vein is relatively straight and has fewer venous valves, while the cephalic vein has a smaller and more uneven lumen, and the presence of a certain angle when it joins the axillary vein can easily cause the catheter to bend [9–10]. To avoid repeated punctures and reduce the time required for guidewire and catheter insertion into the vena cava, priority should be given to puncturing the median cubital vein or basilic vein, followed by the cephalic vein. When puncturing the median cubital vein, the direction of the puncture needle should be biased toward the basilic vein.

5.2. Nursing

During the nursing period, nurses are required to have a clear understanding of the operational methods and key skills involved in the entire examination process, allowing them to flexibly respond to common situations. Psychological intervention should be provided before the surgery to eliminate patients' blind spots regarding relevant knowledge, enabling them to efficiently cooperate with the relevant procedures, prevent negative emotions, reduce blood pressure fluctuations, and alleviate a series of negative impacts such as nervousness, fear, and rapid heart rate. During the surgery, nurses should reasonably control the injection speed to prevent venous rupture, prevent complications such as back pain, closely monitor the patient's vital signs and abnormalities, comfort and encourage the patient, and remind them to maintain a supine position to ensure efficient completion of the surgery and shorten the operation time. After the surgery, nurses should closely observe whether any complications occur, guide patients in hydration therapy to eliminate residual contrast agents in the body and reduce the risk of kidney disease, and provide postoperative health education to patients. Rigorous specialized nursing is crucial to ensure the smooth progress of the patient's blood collection surgery, shorten the operation time, and prevent postoperative complications.

6. Conclusion

By optimizing preoperative scheduling, enhancing psychological support, and ensuring seamless intraoperative collaboration, surgical efficiency can be significantly improved. Prioritizing median cubital or basilic vein

puncture—with needle direction favoring the basilic vein—further reduces procedure time, minimizing patient discomfort (e.g., back pain). Postoperative monitoring and specialized nursing care are critical to lowering complication risks. These strategies collectively enhance patient outcomes and surgical safety.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Funder JW, Carey RM, Mantero F, et al., 2016, The Management of Primary Aldosteronism: Case Detection, Diagnosis, and Treatment: An Endocrine Society Clinical Practice Guideline. The Journal of Clinical Endocrinology and Metabolism, 101(5): 1889–1916.

[2] Milliez P, Girerd X, Plouin PF, et al., 2005, Evidence for an Increased Rate of Cardiovascular Events in Patients with Primary Aldosteronism. Journal of the American College of Cardiology, 45(8): 1243–1248.

[3] Hundemer GL, Curhan GC, Yozamp N, et al., 2018, Cardiometabolic Outcomes and Mortality in Medically Treated Primary Aldosteronism: A Retrospective Cohort Study. Lancet Diabetes Endocrinol, 6(1): 51–59.

[4] Rossi GP, Maiolino G, Flego A, et al., 2018, Adrenalectomy Lowers Incident Atrial Fibrillation in Primary Aldosteronism Patients at Long Term. Hypertension, 71(4): 585–591.

[5] Liu SZ, 2019, The Gold Standard for Diagnosing Subtypes of Primary Aldosteronism: Bilateral Adrenal Venous Sampling. Chinese Journal of Endocrine Surgery, 13(4): 343–345.

[6] Mulatero P, Monticone S, Deinum J, et al., 2020, Genetics, Prevalence, Screening, and Confirmation of Primary Aldosteronism: A Position Statement and Consensus of the Working Group on Endocrine Hypertension of The European Society of Hypertension. Journal of Hypertension, 38(10): 1919–1928.

[7] Urological Surgery Branch of the Chinese Medical Doctor Association, 2020, Functional Classification Diagnosis of Primary Aldosteronism: Expert Consensus on Adrenal Venous Sampling. Modern Urology & Nephrology Magazine, 25(3): 205–208.

[8] Nicolis GL, Mitty HA, Modlinger RS, et al., 1972, Percutaneous Adrenal Venography. A Clinical Study of 50 Patients. Annals of Internal Medicine, 76(6): 899–910.

[9] Magill SB, Raff H, Shaker JL, et al., 2001, Comparison of Adrenal Vein Sampling and Computed Tomography in the Differentiation of Primary Aldosteronism. The Journal of Clinical Endocrinology and Metabolism, 86(3): 1066–1071.

[10] Xing HY, Xu XJ, Wang YZ, 2009, The Effect of Anxiety and Depression on Circadian Blood Pressure Rhythm and Heart Rate Variability in Hypertensive Patients. Journal of Xinjiang Medical University, 32(7): 889–892.