

## **Observations on the effect of autogenous arteriovenous fistula and cuffed and tunneled catheter vascular access in clinical application of hemodialysis.**

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### **Abstract**

**Purpose:** Autogenous arteriovenous fistula and cuffed and tunneled catheter these two different vascular accesses were adopted in patients' hemodialysis for contrastive analysis research on its treatment clinical effect.

**Methods:** A total of 78 patients in our hospital requiring for long-term hemodialysis were divided into 2 groups through random digit distribution method, autogenous arteriovenous fistula (AVF) group and cuffed and tunneled catheter (CTC) group respectively, 39 for each group; venous blood samples were taken after dialysis, and each biochemical index is detected by automatic biochemical analyzer, conducting contrastive analysis on urea clearance index (Kt/V), recirculation rate and complication incidence of two groups respectively after dialysis.

**Results:** Blood urea nitrogen (BUN) and Scr indices were in significant downward trend for two groups after dialysis compared with those before dialysis, with significant difference ( $P < 0.05$ ), and there was no statistical significance ( $P > 0.05$ ) comparing with each index (Hb, plasma-albumin (Alb), total protein (TP), CRP) group after dialysis. Kt/V and recirculation rate levels of Architectural vulnerability factor (AVF) group increased obviously after dialysis compared with CTC group, and the complication incidence was lower than that of control group significantly. **Conclusion** Adopting autogenous arteriovenous fistula vascular access for hemodialysis had more significant effect than that of cuffed and tunneled catheter and less complication, and it had greater clinical advantages, which is worth learning.

**Keywords:** Autogenous arteriovenous fistula, Cuffed and tunneled catheter, Hemodialysis.

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### **Introduction**

As the major alternative of patients with acute renal failure in clinical practice, hemodialysis is the main method of extending patients' survival time and improving survival rate significantly. However, good vascular access is the key of conducting hemodialysis successfully [1]. As a common syndrome disease, acute renal failure refers to abnormal acute renal failure of the patient within short period, electrolyte and metabolic dysfunction, resulting in acidosis, renal damage and hyperkalemia that directly affect the living quality and levels of the patient severely. It is featured by severe condition, higher incidence, fast onset and disease progression; it is resulted from various factors, and its main clinical manifestations are nausea, emesis, spleen and stomach anorexia, edema, hypouricemia, etc.; it may even endanger the life security of the patient [2]. The best method to treat the renal disease patient in final stage is to receive renal transplantation surgery. But due to a lack of renal resource, a small part of patients can realize the renal transplantation

surgery, a majority of patients control the illness by hemodialysis and receive hemodialysis for renal replacement treatment [3,4]. So establishment and maintenance of vascular access is increasingly playing an important role.

The hemodialysis is one of effective methods to clinically treat renal failure and a safe, effective, easy and feasible blood purification method for the treatment of diabetic nephropathy, hypertensive nephropathy, acute and chronic nephritis, polycystic kidney, Renal tubulointerstitial lesion and other diseases. It is reported by the reference that autogenous arteriovenous fistula and cuffed and tunneled catheter hemodialysis each has certain efficacy on acute renal failure respectively. Therefore, autogenous arteriovenous fistula and cuffed and tunneled were adopted for the treatment of the patient treated with hemodialysis in the paper for observing their clinical effect.

## Materials and Methods

### General material

According to the clinical data, it was determined as patients treated with long-term hemodialysis, and both of group cases comply with the clinical diagnosis standard of such disease. 78 patients were involved through filtration, 50 males and 28 females respectively aged from 27-73 with average age between  $46.8 \pm 5.7$  y old. The included patients are sanity, of which the blood pressure is between 90-140/60-90 mmHg, with original 23 diabetic nephropathy cases, 30 chronic glomerular nephritis cases, 20 polycystic kidney cases and 5 hypertensive nephropathy cases. The standard combined coagulative function barrier patients, seriously-infected patients, patients with organic diseases of heart, liver, lung and so on, pregnant or lactating women and person who cannot be normally communicated due to mental or intellectual disorder are excluded. All the candidates are volunteered to receive hemodialysis treatment and sign the informed consent before treatment. Through random distribution, they were divided into autogenous arteriovenous fistula and cuffed and tunneled catheter groups with 39 cases for each group; for the control group, there were 24 males and 15 females aged from 29-73 with average age between  $45.7 \pm 5.6$  y old. For the treatment group, there were 26 males and 13 females aged from 27-72 with average age between  $47.2 \pm 4.5$  y old. All patients involved were approved by the hospital ethic committee. Comparative research was conducted on the data of two groups (in age, gender and other aspects) respectively, comparing and analyzing their  $P$  value  $> 0.05$ , without statistical significance, therefore, it has comparability.

### Therapeutic method

Supine position was adopted for the patients of AVF group, artery and vein vascular paths were marked during the operation, and disinfection and local infiltration anesthesia were conducted. The skin was incised longitudinally between radial artery and cephalic vein, subcutaneous tissues are separated; cephalic vein is found out and separated; the proximal branch is ligated and cut off while the proper silk sutures are threaded for the distal end for standby use; touch the radial artery pulse with the index finger; separate the subcutaneous tissues; separate the radial artery and branch for coupling ligation. The separated cephalic vein is lifted with vessel clamp to confirm that there is no distortion; the proximal end is clamped by vascular clamp, and the distal end is ligated.

**Table 1.** Determination results of biochemical index.

Group	Time	Sr (umol/L)	BUN (mmol/L)	Hb (g/L)	Alb (g/L)	TP (g/L)	CRP (mg/L)
AVF group	Before dialysis	855.15 $\pm$ 218.68	33.24 $\pm$ 8.25	94.34 $\pm$ 8.75	46.30 $\pm$ 4.25	79.35 $\pm$ 6.85	17.21 $\pm$ 7.22
	After dialysis	216.24 $\pm$ 67.20	8.04 $\pm$ 2.10	96.05 $\pm$ 9.61	44.02 $\pm$ 4.61	77.81 $\pm$ 7.05	16.69 $\pm$ 7.01
CTC group	Before dialysis	863.21 $\pm$ 223.03	32.61 $\pm$ 8.22	97.34 $\pm$ 9.05	44.57 $\pm$ 5.02	80.22 $\pm$ 6.95	17.34 $\pm$ 6.99

The intracranial venous cannula is inserted through the right side for the patients of CTC group with 13.6 F  $\times$  36 cm-length cuffed and tunneled catheter (made by TACCO) during dialysis; the puncture needle is adopted for Seldinger procedure to penetrate the antetheca and paries posterior of the blood vessel; the needle core is drawn out and withdraw the needle slowly; the guide wire is inserted immediately when there is blood ejected from the end of the needle, introducing the catheter through the guide wire. The subcutaneous tunnel is established through the catheter method of avulsed expansion catheter, and cuffed and tunneled catheter is adopted for fixation. The Bbraum hemodialysis machine and Fresenius F6 dialyzer (1.3 cm<sup>2</sup> film area) are adopted. The dialyzer is single-use and dialyzed with the bicarbonate dialyzate.

### Evaluation standard

Venous blood sample is taken for patients before and after dialysis, and the automatic biochemical analyzer is adopted for detecting each index, including Hb, plasma albumin (Alb), total protein (TP), CRP, blood urea nitrogen (BUN), creatinine (Scr). Urea clearance index (Kt/V) and recirculation rate (GIT method determination) are calculated.

### Statistical method

SPSS 14.0 statistical software was adopted for two groups with different treatment method after treatment for comparison and analysis; and t test method was adopted, which is applicable to measurement data, mean value  $\pm$  standard deviation, i.e.,  $\bar{x} \pm s$ ).

## Results

### Biochemical index determination for two groups

In Table 1 through comparison among groups, there are no much difference among the indices level such as Hb, Alb, TP, CRP, BUN and Scr in two groups before and after dialysis, and there is no significance for the difference within group ( $P > 0.05$ ). It is found that the contents of serum creatinine and blood urea nitrogen biochemical indices of the patients in AVF and CTC group are reduced significantly after dialysis ( $P < 0.05$ ), while it can be known through comparison and analysis on human serum creatinine and blood urea nitrogen contents that there is no statistical significance ( $P > 0.05$ ) for the difference within the group.

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After dialysis	234.84 ± 71.60	7.91 ± 2.14	94.60 ± 9.54	43.28 ± 4.37	78.51 ± 6.87	17.19 ± 7.16
P value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Note: \*P<0.05 compared with before dialysis

**Compare the effect of urea clearance index (Kt/V) and recirculation rate**

After dialysis, Kt/V for AVF group is calculated to (1.69 ± 0.16); Kt/V for CTC group is calculated to (1.25 ± 0.14), and there is statistical significance (P<0.05) for the comparison of two groups. Through the data results, it can be known that the recirculation rate of AVF group is significantly increased compared with CTC group, with significance (P<0.05), as shown in Table 2.

**Table 2.** Urea clearance index (Kt/V) and recirculation rate results.

Group	Kt/V	Recirculation rate (%)
AVF group	1.69 ± 0.16	0.27 ± 0.06
CTC group	1.25 ± 0.14	0.16 ± 0.04
P value	0.035	0.044

**Complication comparison**

Compared with CTC group, the complication incidence of AVF group is decreased significantly with less side effect and higher safety (Table 3).

**Table 3.** Adverse reaction results.

Group	Thromboembolism	Infection	Incidence (%)
AVF group	1	2	7.7%
CTC group	3	4	17.9%

**Discussion**

As one of blood purification methods, the principle of semi-permeable membrane is adopted for hemodialysis to eliminate various noxious substances, metabolic waste and electrolytes in the blood to discharge with the method of diffusion and convection; endogenous toxins are reduced slowly until the harmful substances are eliminated, enabling blood purification and reaching balanced electrolyte. Although hemodialysis has the above effects, there are limits in eliminating macromolecules, high lipid solubility and plasma proteins easy to combine resulting in toxication [5-7]. It is an important method to treat acute renal failure; it can remit the deterioration of the condition effectively and extend the life of the patients, and it is also an effective method of reaching blood purification.

With the development of the society, patients with acute renal failure are increased significantly; there are many causes, such as bites, heavy metal poisoning, etc.; within the short period of

onset, the renal function is damaged, and the acute renal failure is reduced, making serum creatinine, blood urea nitrogen and other indices contents rise quickly and inhibiting the relative equilibrium of water-electrolyte and metabolic disorders, causing uremia, hyperpotasemia and other syndromes easily. The serious condition may disable the whole body organs with higher disability rate and fatality rate and cause complications easily; it has great impact on the living level and working quality of the people, which is highly concerned by the doctors in clinical treatment. At present, the main treatment methods include autogenous arteriovenous fistula and cuffed and tunneled catheter these two different vascular accesses with different efficacy. The common used vascular accesses in the clinical hemodialysis recently include autogenous arteriovenous fistula (AVF) and cuffed and tunneled catheter (CTC). AVF is recently acted as a permanent widely-used vascular access to artificially form internal arteriovenous direct pipe by subcutaneously connecting certain close artery and superficial vein vessels, which can increase blood flow volume of superficial veins and have easy-to-use, safe, low-price and other advantages. The cuffed and tunneled catheter can be immediately used after being established and does not need to be punctured at the time of dialysis, with high comfort level and so on. Two treatment effects are different. [7]

According to the research results of the paper, it is shown that there is no significance (P>0.05) for the difference comparison among groups for the indices level such as Hb, Alb, TP, CRP, BUN and Scr in two groups before dialysis. After dialysis, the serum creatinine and blood urea nitrogen biochemical indices level of the patient in both AVF and CTC groups are reduced significantly, but there is no statistical significance (P>0.05) for the difference among groups. Compared with CTC group, Kt/V and recirculation rate level of the patient in AVF group after dialysis is increased significantly, and the complication incidence is obviously lower than that of the control group; it can be known that adopting autogenous arteriovenous fistula for treatment during dialysis has obvious curative effect and less complications and it is easy to reach treatment purpose. It indicates that autogenous arteriovenous fistula can control the symptoms quickly, improve the symptoms better and obtain better clinical efficacy. The analytic reason may be that there is no externally connected catheter for AVF vascular access after is arteriovenous fistula formed, which may not cause the risk of massive haemorrhage due to shedding of catheter, meanwhile the infection rate is relatively low.

In conclusion, measures are taken actively for dialysis patient to deal with the damage of acute renal failure to the human body; through the research, it indicates that the application of autogenous arteriovenous fistula has obvious improvement for the treatment of such disease, has certain superiority, it is more

helpful for controlling the disease, and it has certain guiding significance during treatment; it provides with alternative treatment, grasps the treatment opportunity for the patient timely and provides with ideal method for the treatment. Therefore, reasonable and effective treatment can reach the purpose of curing quickly, which is worthy of clinical reference.

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