The Use of Arteriovenous Fistulas and Arteriovenous Graft in Critically Ill End-Stage Kidney Disease Patient with Continuous Renal Replacement Therapy

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Introduction

ESKD patients that are critically ill have readily available access for CRRT however there is reluctance to use AVF and AVG with CRRT due to fear of damaging the access. In these instances, temporary dialysis catheters are placed for CRRT. There was one study done at the University of Michigan demonstrating the feasibility of performing CRRT using AVF's and AVG's accessed with 15-gauge steel needles in 2018 [1]. However, since that study, there has been a lack of studies characterizing the safety profile using functional vascular access in critically ill ESKD patients. Using a novel method of accessing AVF's and AVG's with 16-gauge angiocaths, we examined the patient population and complications with using this technique with critically ill patients on CRRT.

1. Al Rifai, A et al. Hemodial Int. 2018 Jan;22(1):50-55.

Methods and Materials

A retrospective single-center study in a large tertiary care hospital, examined between 2012 to 2019, the use of AVF/AVG in 50 patients who were 18 years or older, ESKD on maintenance hemodialysis (HD) with functional AVF/AVG who required CRRT. The AVF/AVG were accessed using a 16-gauge angiocatheter made by BD Insyte™ Autoguard™ and changed every 72 hours with M100 filters. The study excluded ESKD patients on HD via a tunneled catheter or peritoneal dialysis (PD). Data collected from medical charts included demographics, duration and characteristics on CRRT and AVF/AVG complications if any. Based on the analysis criteria, 35 out of 50 of the patients matched the parameters to be included for analysis. Patient characteristics were described using mean ± standard deviation for continuous variables and frequency (%) for categorical variables (Table 1). All analyses were performed in SAS version 9.4 (SAS Institute, Cary, North Carolina).

Results

Figure 1: AVF/AVG Can Be Accessed for CRRT Using 16-gauge Angiocaths

a)

b)

c)

Figure 1: Using the 16-gauge angiocatheter made by BD Insyte™ Autoguard™ we are able to access AVF and AVG (Figure 1a). The angiocaths access a left upper extremity AVF in a secure fashion as demonstrated and monitored by nursing during the CRRT session using a Baxter Prismaflex CRRT machine (Figure 1b and 1c).

Table 1: Patient and Treatment Characteristics

	Mean ± SD / N (%)
	N = 35
Age (years)	65.7 ± 12.2
Gender	
Male	23 (65.7%)
Female	12 (34.3%)
Ethnicity	
Caucasian	24 (68.6%)
African-American	4 (11.4%)
Hispanic	6 (17.1%)
Asian	1 (2.9%)
Other	0
Access Type	
AVF	30 (85.7%)
AVG	5 (14.3%)
Age of access (years)	3.0 ± 2.0
Mode of CRRT	
CVVHDF only	27 (77.1%)
Other	8 (22.9%)
Length of CRRT (days)	3.8 ± 3.9

Table 1: Thirty-five patients between the years 2012-2019 were treated with CRRT using AVF/AVG. The mean age of the cohort was 65.7± 12.2 years. A majority of the patients were male and Caucasian. Eighty-five percent of the accesses used for CRRT were AVF. Patients were mostly treated using CVVHDF with the mean treatment length being 3.8± 3.9 days.

Figure 2
Complications Arising from CRRT

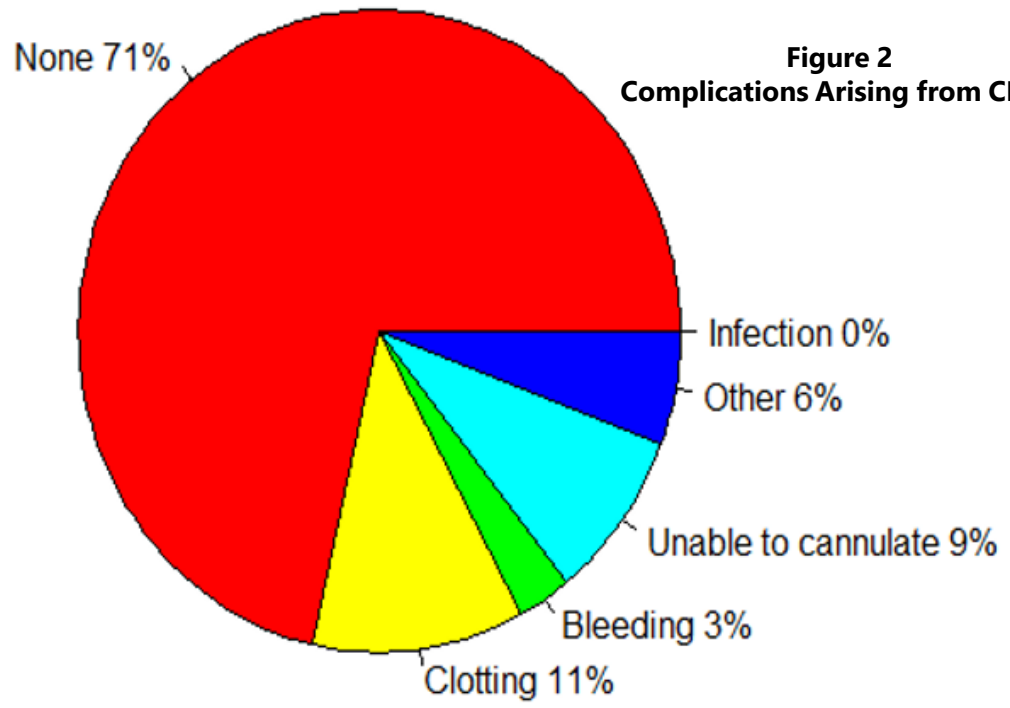

Figure 2: A majority of the patients (71%) experienced no complications during the use of CRRT with AVF/AVG. The second most common complication, at 11%, was clotting issues with the dialysis filters and not the AVF/AVG. Nine percent of the complication patients experience involved not being able to canulate the AVF's/AVG's. There were minimal bleeding complications (3%) involving the vascular dialysis accesses. Lastly, there were no reported infectious complications.

Conclusions

Our study has shown that using AVF/AVG in critically ill ESKD patients has little to no adverse events. There were minor vascular access complications caused by using AVF/AVG for CRRT, however, they did not contribute negatively to patient outcomes. This technique has the potential to provide faster and safer access to initiating CRRT in ESKD patients. To evaluate the safety, benefits, and outcomes, further research is needed to compare temporary dialysis catheters versus AVF/AVG for CRRT.

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