The Use of the Novel Tablo Hemodialysis System to Treat Life-Threatening Hyperkalemia: A Retrospective Case Series

Michelle Shieh, MD[1]; Michael A. Aragon, MD[2]; J. Pedro Teixeira, MD[1]

[1]Division of Nephrology, Department of Internal Medicine, University of New Mexico School of Medicine, Albuquerque, NM. [2]Outset Medical, San Jose, CA.

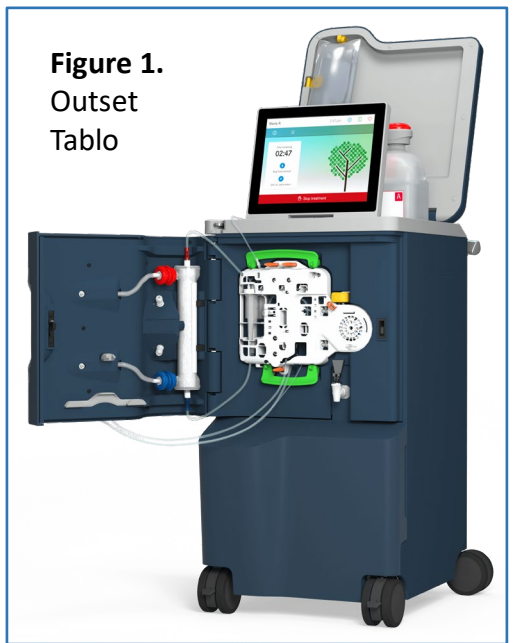
1. Introduction

The Tablo Hemodialysis (HD) System (Outset Medical) is a next-generation, self-contained HD device approved by the FDA in 2016. Tablo has an integrated reverse osmosis system with the ability to produce dialysate on demand, allowing for use in any location with a potable water source. This, and the small device footprint, results in increased portability, leading to our institutional adoption of Tablo as our default portable intermittent HD (IHD) device. The maximum dialysate rate (Qd) allowed by Tablo is 300 mL/min. This study was conducted to assess Tablo's ability, at a Qd of 300 mL/min, to provide the rapid solute clearance needed to treat severe hyperkalemia.

2. Methods and Materials

We carried out a retrospective review of all treatments using Tablo at the University of New Mexico Hospital (UNMH) from May 1, 2020, to September 30, 2021. A total of 473 admissions with at least 1 Tablo treatment were screened. 77 patients with a peak serum K of ≥ 6.5 mEq/L were identified. We excluded 26 treated with medical therapy resulting in K <6.5 mEq/L prior to HD, 20 treated with another device [continuous renal replacement therapy (CRRT) or traditional IHD] before Tablo, 5 treated with Tablo for <3h, and 4 with incomplete records, yielding 22 patients for final analysis.

Figure 1. Outset Tablo



3. Results

The patient and prescription details for the treatments are show in the table below. All 22 HD sessions used a Revaclear 300 dialyzer (Baxter) and 20/22 used a 2 mEq/L K bath. With a mean treatment length of 3h 55 min ± (standard deviation) 25 min and mean Qb of 361 ± 41 mL/min, a mean pre-HD K of 7.0 ± 0.4 mEq/L (range 6.5-7.9) was lowered to a mean post-HD K within the normal range at 4.7 ± 0.7 mEq/L (range 3.8-6.6).

4. Limitations

As all data were obtained from usual care, intervals between K measurement and HD initiation and discontinuation were variable. Also, additional non-dialytic changes in K balance during these intervals or during treatments (e.g., from residual renal function) and the effects of ongoing K-lowering medical therapy are not captured by these data.

5. Conclusions

These data suggest that HD with Tablo using a standard high-flux dialyzer and a Qd of 300 mL/min can be effective in the emergent treatment of life-threatening hyperkalemia. While at UNMH we use portable Tablo treatments to complement our ICU-based CRRT program and the traditional IHD machines in our acute HD unit, Tablo can be used to provide the full RRT spectrum from continuous 24-hour therapy to standard IHD. This study is especially relevant to centers with a Tablo-only program as it shows that Tablo can readily achieve the standard of care for patients requiring emergent dialytic treatment of hyperkalemia.

Subject Number	Age (years)	Gender	AKI or ESKD	Pre-HD weight (kg)	Pre-HD K (mEq/L)	Interval from pre-HD K to HD (h:mm)	Treatment Duration (h:mm)	Post-HD K (mEq/L)	Interval from HD to post-HD K (h:mm)	Change in K (mEq/L)	UF (mL)	HD Access	Qb (mL/min)	Qd (mL/min)	K bath (mEq/L)
1	52	M	ESKD	100.3	6.6	0:10	3:32	4.6	2:02	-2.0	4000	fistula	400	300	2
2	48	M	ESKD	102.5	7.7	3:55	3:49	5.5	8:41	-2.2	4000	fistula	400	300§	2
3	54	M	ESKD	87.9	6.9	3:54	4:03	4.2	0:37	-2.7	2000	fistula	400	300	2
4	59	M	ESKD	76.3	6.6	2:17	4:16†	5.2*	5:38	-1.4	3900	fistula	361.7‡	300	2
5	63	M	ESKD	115.3	7.3	2:47	5:01	4.6	3:18	-2.7	480	fistula	355.5‡	300	2
6	65	M	ESKD	71.2	7.3	0:53	3:52	5.0	4:50	-2.3	0	fistula	350	300	2
7	64	F	ESKD	49.5	6.9	3:36	4:09	4.4	4:13	-2.5	1000	tunneled cath	338.0‡	300	2.15‡
8	46	M	ESKD	70.6	7.3*	6:23	3:58	5.1	0:17	-2.2	3000	tunneled cath	350	300	2
9	60	M	ESKD	111	6.6	2:48	4:05	5.9*	3:47	-0.7	1000	fistula	400	300	2
10	52	M	ESKD	114.7	6.5	6:08	4:00	3.8	0:40	-2.7	500	fistula	400	300	3.4‡
11	55	M	ESKD	74.4	7.3	1:08	4:17	4.4	8:37	-2.9	1500	fistula	400	300	2
12	49	M	ESKD	70.5	7.3	2:41	3:58	6.6	1:22	-0.7	0	fistula	300	300	2
13	67	M	ESKD	61.8	7.3	1:39	3:59	4.8	2:16	-2.5	1040	fistula	400	300	2
14	59	M	ESKD	122.3	6.6	2:25	4:14	4.6	9:26	-2.0	2100	fistula	400	300	2
15	78	F	AKI	81.1	6.9	0:27	3:26†	4.9	7:07	-2.0	-400	temporary cath	250	300	2
16	55	M	AKI	68.9	7.9	0:34	3:49	4.1	1:30	-3.8	-200	temporary cath	343.4‡	300	2
17	41	M	AKI	66.7	6.7	3:09	3:00	3.8	2:21	-2.9	1000	temporary cath	350	300	2
18	64	M	ESKD	74.1	6.6	1:38	3:40	4.1	2:08	-2.5	1810	temporary cath	350	300§	2
19	36	M	ESKD	61	6.5*	4:31	4:07	4.6	4:22	-1.9	1000	temporary cath	313.0‡	300	2
20	47	M	ESKD	76.6	6.8	6:12	4:00	3.9	4:36	-2.9	3990	tunneled cath	350	300§	2
21	64	F	AKI	133.4	6.7*	3:41	3:12	4.7	3:52	-2.0	0	temporary cath	331.0‡	300	2
22	79	M	AKI	50.9	7.5	6:34	3:42	5.4	12:28	-2.1	-100	temporary cath	400	200	2
Mean	**57.1**			**83.7**	**7.0**	**3:04**	**3:55**	**4.7**	**4:17**	**-2.3**	**1437**		**361.0**	**295.5**	**2.07**
Std Dev	**±10.7**			**±23.8**	**±0.4**	**±1:59**	**±0:25**	**±0.7**	**±3:14**	**±0.7**	**±1486**		**±40.5**	**±22.4**	**±0.3**

*Blood samples with slight-to-moderate hemolysis. †Treatments 4 and 15 were interrupted by 29- and 24-minute stoppages, respectively; reported time excludes interval off treatment. ‡Treatment parameter was adjusted during treatment; time-weighted average reported. §Treatments 2, 18, and 20 had charted Qd >300 mL/min, which is impossible with Tablo; these Qd rates are presumed to be erroneously recorded and max Qd of 300 is reported. Abbreviations: AKI, acute kidney injury; cath, catheter; ESKD, end-stage kidney disease; HD, hemodialysis; Qb, blood flow rate; Qd, dialysate rate; Std Dev, standard deviation; UF, ultrafiltration (positive is volume removed).