Relationships between intradialytic body weight reduction and outcome of vascular access

Using data from the Japan Dialysis Outcomes and Practice Patterns Study (J-DOPPS)

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Background

Large-volume ultrafiltration has been thought to be an important risk factor for vascular access (VA) trouble in hemodialysis patients. However, the relationship between intradialytic body weight reduction and VA patency remains unclear. The aim of the study was to determine whether large-volume ultrafiltration was associated with VA failure by means of the results obtained from the phase 4 J-DOPPS.

Methods

We analyzed data from the phase 4 J-DOPPS, current analyses were limited to 1957 patients for whom it was possible to evaluate VA patency and body weight change during dialysis. Missing data were replaced by their mean or median values. According to the quartiles of intradialytic fluid removal per body weight, the subjects were divided into 4 groups as follows Q1: -8.3 to 2.8%, Q2: 2.8 to 3.9%, Q3: 3.9 to 4.9% and Q4: 4.9 to 11.7%. The hazard ratios of VA failure were compared across these groups using Cox regression models. The models were adjusted for the known risk factors (e.g. age, gender, BMI, diabetes, hemoglobin, phosphorus, Kt/V, ESA use, antiplatelets use). Primary VA patency was defined as the time until the first VA intervention, and secondary patency was calculated as the time until the new VA creation.

Results

Baseline demographic and other characteristics in the study population*. (Table 1) *: There were no significant baseline differences among the four groups in terms of age, gender, BMI, diabetes, phosphorus, albumin, access blood flow, Kt/V, ESA use or antiplatelets use.
Incidence rates of VA events stratified by quartile of fluid removal per body weight*. (Table 2) *: The incidence rates of primary and secondary VA events were 8.1 and 2.3%, 4.9 and 1.4%, 7.2 and 2.0%, 6.6 and 1.9% for Q1, 2, 3, 4, respectively.
Association of patient characteristics with arteriovenous fistula (AVF) failure.* (Table 3) *: The adjusted hazard ratios for primary AVF patency versus Q2 group were 1.48 (95% confidence interval [CI], 1.02 to 2.15; p=0.04) in Q1, 1.57 (CI, 1.09 to 2.24; p=0.01) in Q3 and 1.49 (CI, 1.03 to 2.15; p=0.04) in Q4, respectively. The hazard ratios for secondary VA patency versus Q2 group were 1.45 (CI, 0.74 to 2.85; p=0.34) in Q1, 1.44 (CI, 0.75 to 2.76; p=0.33) in Q3 and 1.46 (CI, 0.74 to 2.86; p=0.34) in Q4, respectively.
Kaplan-Meier curves for primary and secondary AVF survival. (Fig): The percent AVF without a primary failure after 1 year was 88.8, 92.8, 90.1 and 91.3% in Q1, Q2, Q3 and Q4 group, respectively. Subjects in Q2 group had higher primary and secondary AVF patency compared with other groups.

Limitations

Dialysis vintages were 0.8, 3.9, 5.5 and 5.6 years by Q1, Q2, Q3 and Q4 group, respectively. Especially, Q1 group had the shortest dialysis vintage compared with other groups. There were many hemodialysis patients with short dialysis vintage and body weight loss in Q1 group. Therefore, Q1 group might have included many patients with poor general condition that affects VA patency and initial VA failure.

Conclusions

The present study showed that intradialytic ultrafiltration volume was significantly associated with primary AVF failure in hemodialysis patients. We would like to recommend less than 4% of body weight gain between dialyses with respect to VA patency.

Table 1: Baseline demographic and other characteristics in the study population

Baseline Characteristics	Whole	Quartile of fluid removal per body weight Q1 -8.3 - 2.8%	Q2 2.8 - 3.9%	Q3 3.9 - 4.9%	Q4 4.9 - 11.7%
Fluid removal per body weight	3.9% (1.7%)	1.7%	3.4%	4.4%	5.9%
Age, years, mean (SD)	64.6 (12.3)	65.1 (13.4)	65.2 (11.7)	64.9 (11.5)	63.2 (12.5)
Female sex, %	35.4	29.5	36.2	35.6	40.1
Vintage, years, median (IQR)	3.9 (0.7 to 9.5)	0.8 (0.2 to 4.8)	3.9 (1.0 to 9.6)	5.5 (1.4 to 11.9)	5.6 (2.3 to 10.7)
Diabetes, %	39.0	40.9	40.5	35.3	39.5
BMI, kg/m^2, mean (SD)	21.3 (3.4)	21.8 (3.4)	21.9 (3.7)	21.2 (3.1)	20.5 (3.1)
Serum phosphorus, mg/dL, mean (SD)	5.4 (1.4)	5.0 (1.2)	5.4 (1.4)	5.4 (1.3)	5.7 (1.5)
Serum albumin, g/dL, mean (SD)	3.7 (0.4)	3.6 (0.5)	3.7 (0.4)	3.8 (0.4)	3.7 (0.4)
Kt/V, mean (SD)	1.3 (0.3)	1.2 (0.3)	1.3 (0.3)	1.4 (0.3)	1.4 (0.3)
Access blood flow, ml/min, mean (SD)	202 (44)	197 (52)	199 (31)	205 (44)	209 (47)
ESA use, %	29.3	23.3	29.5	32.5	31.9
Antiplatelets use, %	38.6	35.8	39.5	40.6	38.5

Table 2: Incidence rates of VA events stratified by quartile of fluid removal per body weight

Incidence rates of primary VA event

		Whole				AVF			AVG		
		n	Person-years	Event	Incidence rate (%)	Person-years	Event	Incidence rate (%)	Person-years	Event	Incidence rate (%)
Total		1,957	4,082	272	6.7	3,827	238	6.2	254	34	13.4
Fluid removal	Q1	489	866	70	8.1	832	64	7.7	34	6	17.6
	Q2	489	1,053	52	4.9	963	42	4.4	89	10	11.2
	Q3	490	1,076	78	7.2	1,008	69	6.8	68	9	13.2
	Q4	489	1,087	72	6.6	1,024	63	6.2	63	9	14.3

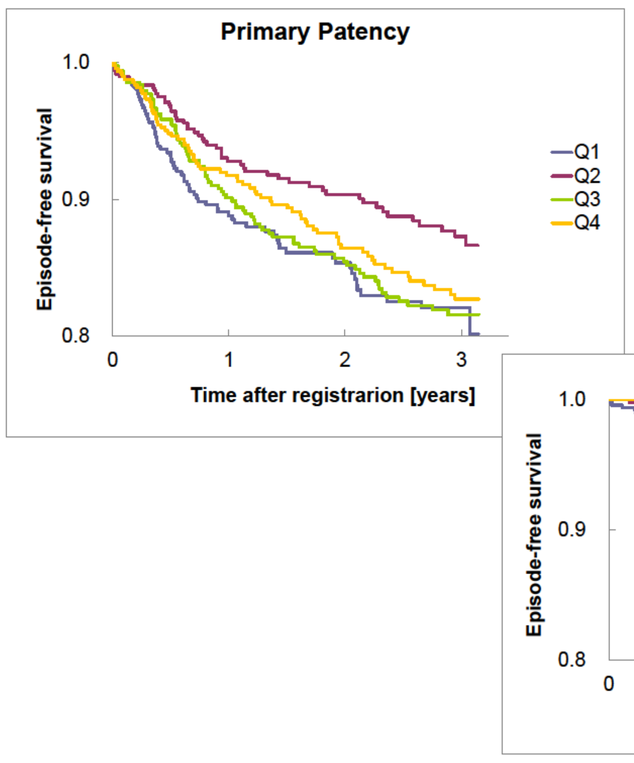
Incidence rates of secondary VA event

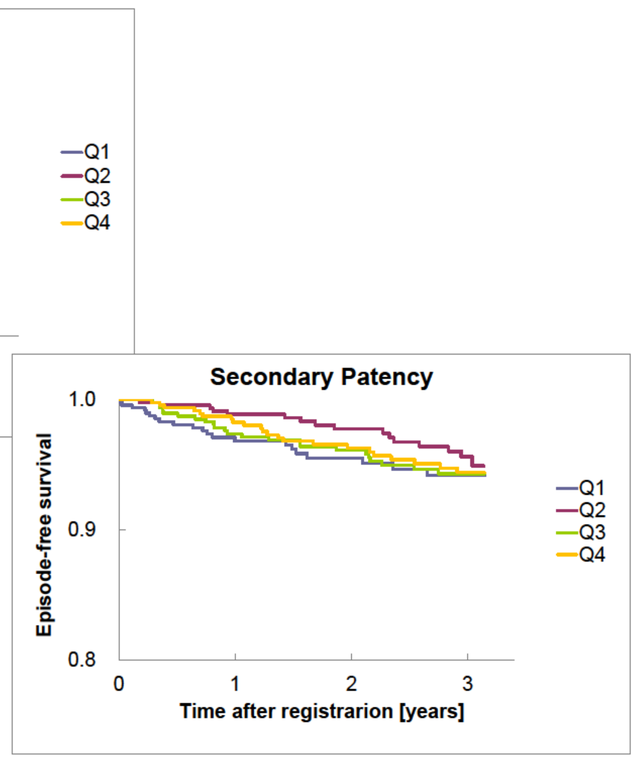
		Whole				AVF			AVG		
		n	Person-years	Event	Incidence rate (%)	Person-years	Event	Incidence rate (%)	Person-years	Event	Incidence rate (%)
Total		1,957	4,370	82	1.9	4,074	72	1.8	295	10	3.4
Fluid removal	Q1	489	932	21	2.3	892	18	2.0	39	3	7.7
	Q2	489	1,108	16	1.4	1,005	13	1.3	103	3	2.9
	Q3	490	1,160	23	2.0	1,080	21	1.9	80	2	2.5
	Q4	489	1,170	22	1.9	1,097	20	1.8	73	2	2.7

Table 3: Association of patient characteristics with AVF failure

Parameter	Primary patency HR	95% CI			p value	Secondary patency HR	95% CI			p value
Quartile of fluid removal										
Q1 (-8.3 - 2.8%)	**1.48**	**1.02**	**to**	**2.15**	**0.04**	1.45	0.74	to	2.85	0.34
Q2 (2.8 - 3.9%)	1.00		Ref			1.00		Ref		
Q3 (3.9 - 4.9%)	**1.57**	**1.09**	**to**	**2.24**	**0.01**	1.44	0.75	to	2.76	0.33
Q4 (4.9 - 11.7%)	**1.49**	**1.03**	**to**	**2.15**	**0.04**	1.46	0.74	to	2.86	0.34
Age [years]										
20-39	1.05	0.51	to	2.20	0.89	1.77	0.52	to	5.99	0.62
40-59	1.02	0.75	to	1.38	0.91	1.30	0.76	to	2.22	0.27
60-74	1.00		Ref			1.00		Ref		
75-	1.34	0.98	to	1.83	0.07	1.13	0.63	to	2.04	0.30
Female (vs. male)	0.96	0.72	to	1.27	0.75	0.95	0.58	to	1.57	0.25
Vintage [years]										
<1.0	**2.06**	**1.45**	**to**	**2.92**	**0.00**	2.64	1.34	to	5.23	0.35
1-5	1.00		Ref			1.00		Ref		
5-10	1.05	0.71	to	1.53	0.82	1.53	0.78	to	2.99	0.34
10-	1.36	0.94	to	1.97	0.10	1.58	0.80	to	3.14	0.35
AVG (vs. AVF)	**2.08**	**1.43**	**to**	**3.03**	**0.00**	1.79	0.89	to	3.60	0.36
Diabetes mellitus (vs. none)	1.27	0.97	to	1.67	0.08	1.03	0.62	to	1.72	0.26
Kt/V										
<1.2	0.93	0.68	to	1.26	0.62	0.47	0.24	to	0.90	0.33
1.2-1.59	1.00		Ref			1.00		Ref		
1.6-	1.19	0.83	to	1.72	0.34	1.03	0.55	to	1.94	0.32
Blood flow (per 100 ml/min)	0.99	0.72	to	1.36	0.93	**0.96**	**0.54**	**to**	**1.70**	**0.00**
Serum albumin (per 1 g/dL)	1.05	0.77	to	1.43	0.78	1.05	0.58	to	1.89	0.30
Hemoglobin (per 1 g/dL)	0.95	0.86	to	1.05	0.33	0.79	0.66	to	0.94	0.09
ESA use (vs. none)	**0.68**	**0.51**	**to**	**0.90**	**0.01**	0.86	0.52	to	1.42	0.26
Antiplatelets use (vs. none)	**1.33**	**1.03**	**to**	**1.72**	**0.03**	1.15	0.72	to	1.84	0.24

Fig. Kaplan-Meier curves for primary and secondary AVF survival





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