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# DIALYSIS DISEQUILIBRIUM SYNDROME IN INCREMENTAL HEMODIALYSIS

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## Background

- Dialysis disequilibrium syndrome is a well-known complication of hemodialysis. However, this complication has been tightly linked to the initial sessions of hemodialysis.
- With recently established incremental hemodialysis program, we found that our patients had dialysis disequilibrium syndrome during chronic once-weekly hemodialysis, long after several initial sessions.

## Methods

- We prospectively collected data of patients participated in our incremental hemodialysis program.
- Patients with substantial residual renal function and daily urine output were invited to participate in this program.
- The initial prescription was once-weekly 120-min hemodialysis using low-flux dialyzer.
- Duration of hemodialysis was later increase to 240 min and hemodialysis filter was later change to higher clearance to ensure hemodialysis adequacy.

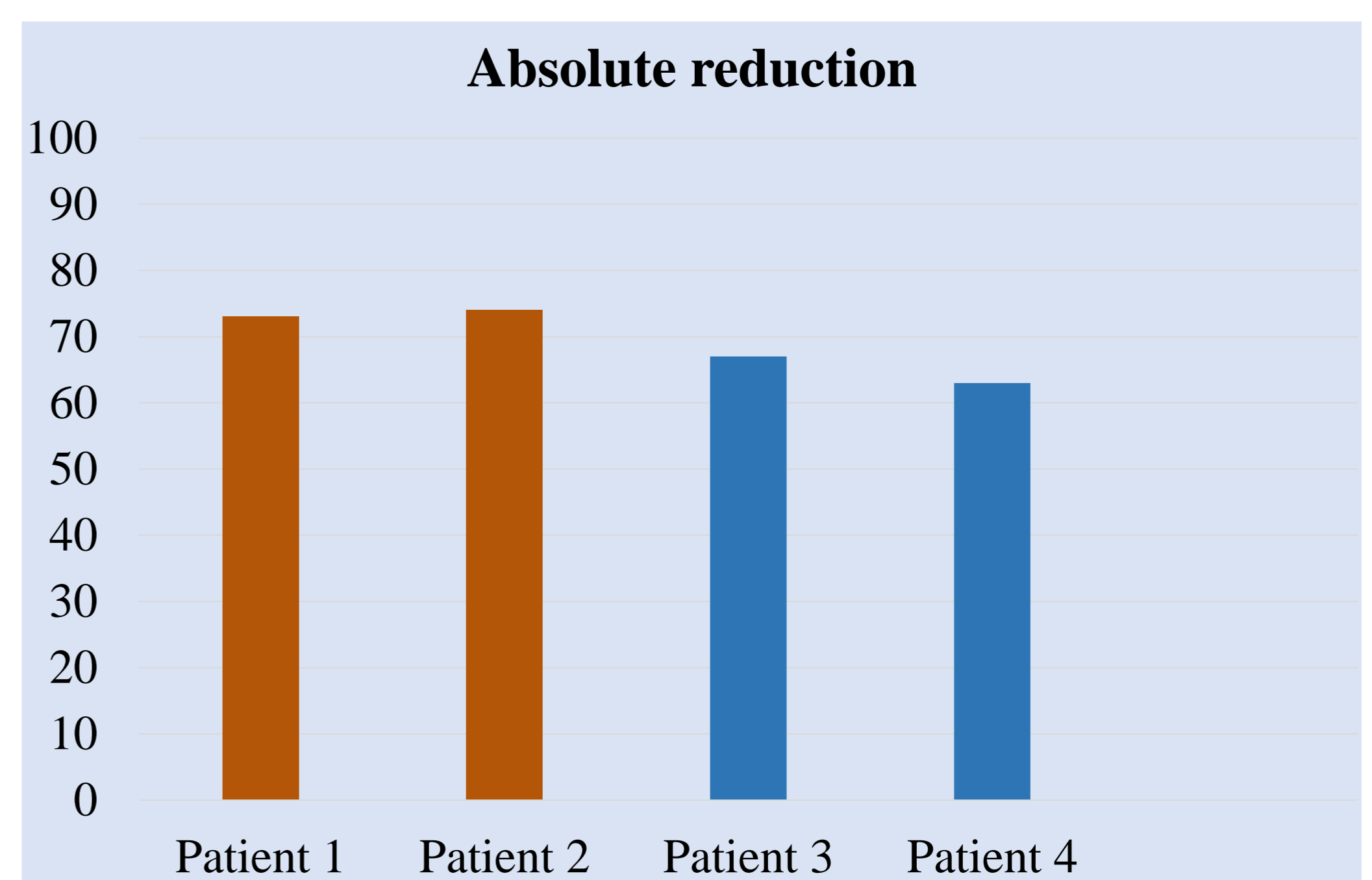
## Results

### Standard hemodialysis prescription phase

- Four patients participated in our incremental hemodialysis program.
- Two patients complained headache starting from 2<sup>nd</sup>-hour of hemodialysis and persisted until the next day. The headache was partially improved with 50% glucose 50 -100 ml given during the last hour of hemodialysis. In some sessions, the headache was very severe and the patient had nausea, vomiting and blurred vision. The symptoms occurred, with varying severity, in every once-weekly hemodialysis session and did not occurred when the patients were switched to twice-weekly hemodialysis suggesting that these symptoms were caused by dialysis disequilibrium syndrome (DDS).
- The other 2 patients did not have these problems.

**Table 1** Characteristics of patients undergoing once-weekly hemodialysis

Data	Patient 1	Patient 2	Patient 3	Patient 4
Gender	Male	Female	Female	Male
Age	36	53	60	74
Co-morbidity	-	HT	-	DM,HT, CAD
Vascular Access	AVF	AVF	Tunneled catheter	Tunneled catheter
Dry weight (kg)	55	46	71	65
Residual renal function (ml/min)	3.01	3.4	5.32	5.41
Residual urine (ml/day)	1510	2025	2265	2415
nPCR (g/kg/day)	0.67	0.96	1.07	0.76
HD Prescription	4 hr x 1/wk	4 hr x 1/wk	4 hr x 1/wk	4 hr x 1/wk
BFR	300	300	300	300
DFR	600	600	600	600
KoA dialyzer	1064.86	10080.65	10080.65	10080.65
spKt/V	1.74	2.63	1.62	1.65
Urea reduction ratio (URR,%)	77.66	89.16	76.14	75
Absolute urea reduction (mg/dl)	73	74	67	63
Dialysis disequilibrium	Yes	Yes	No	No



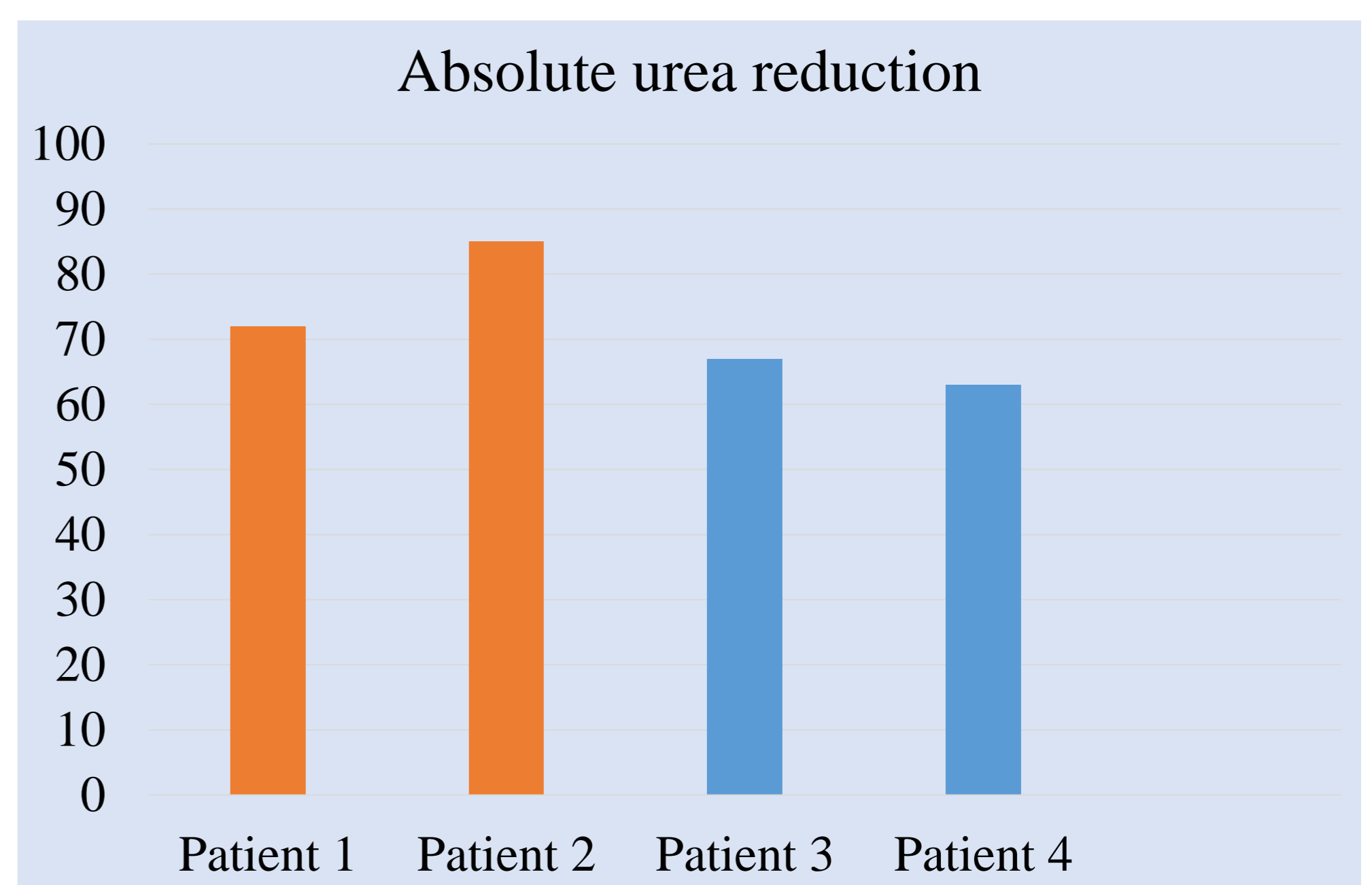
**Figure 1** Absolute urea reduction during the standard prescription phase

### Modified hemodialysis prescription phase

Although switching to twice-weekly hemodialysis would prevent DDS, the patients preferred once-weekly schedule. Therefore, the once-weekly HD prescriptions of patients who suffered from DDS were modified using the step-up protocol (Table 2) . The headache was substantially improved under the modified prescription.

**Table 2** Prescription of hemodialysis during the modified prescription phase

Prescription of HD	Patient 1	Patient 2	Patient 3	Patient 4
	"Step-Up Protocol"			
BFR / DFR	1 <sup>st</sup> hr: BFR 200 / DFR 200 2 <sup>nd</sup> hr: BFR 250 / DFR 500 3 <sup>rd</sup> hr: BFR 400 / DFR 800 4 <sup>th</sup> hr: BFR 400 / DFR 800		BFR 300/ DFR 600 throughout 4-hr session	BFR 300/ DFR 600 throughout 4-hr session
KoA dialyzer	1080.65	1080.65	1080.65	1080.65
spKt/V	1.74	2.52	1.62	1.65
Urea reduction ratio (URR,%)	77.42	87.76	76.14	75
Absolute urea reduction (mg/dl)	72	86	67	63
Dialysis disequilibrium	No	No	No	No



**Figure 2** Absolute urea reduction during the modified prescription phase

## Conclusions

- Incremental hemodialysis program using once-weekly hemodialysis should be aware of dialysis disequilibrium syndrome even after several initial sessions.
- Step-up prescription protocol might help to prevent dialysis disequilibrium syndrome in these patients.