

# **HD vs HDF**

## **“New” results from Gothenburg**

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# Background

Dialysis related symptoms and general well being

HDF better?

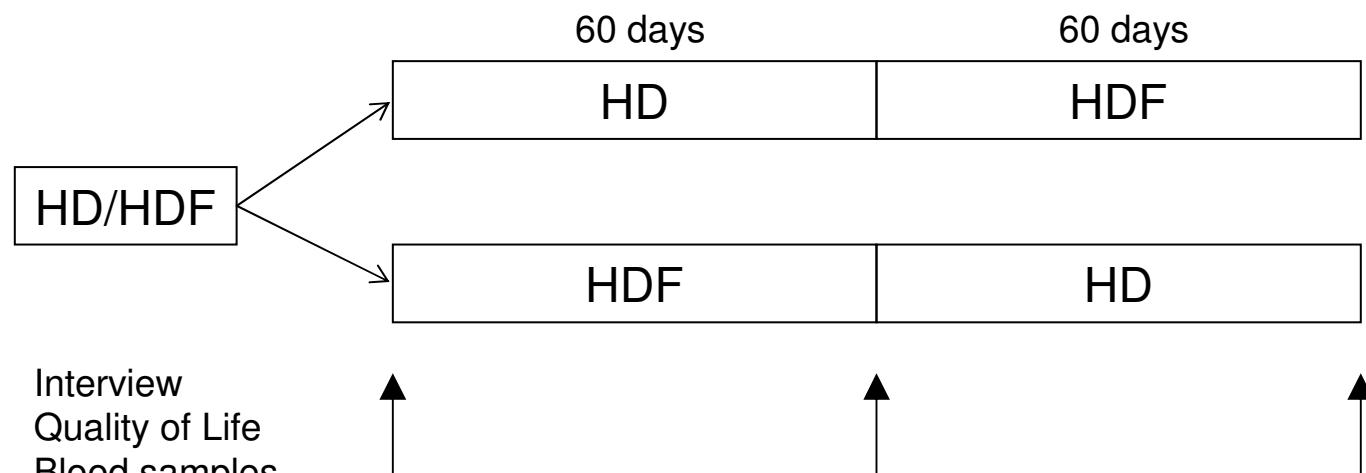


# Aims

- To compare low-flux HD and HDF regarding to
  - Dialysis related complications
  - Quality of Life
  - Blood pressure
  - Routine clinical chemistry
  - Oxidative stress and inflammation
  - ESA and iron utilization

# Methods

- Prospective, randomized, cross-over, participant blinded
- Low-flux HD (PF17) vs post-dilution HDF (PF21S)



# Patients

	Value
Age (years)	$60.6 \pm 13.6$
Gender (male/female)	14/6
Causes of renal failure (n)	
Diabetic nephropathy	7
Chronic glomerulonephritis	4
Nephrosclerosis	4
Adult polycystic kidney disease	2
Chronic interstitial nephritis	3
Dialysis modality before inclusion (HD/HDF)	15/5
Central venous dialysis catheter (n)	12
AV fistula (n)	8
Dry weight (kg)	$78.9 \pm 15.1$

Mean  $\pm$  SD

# Dropouts

	HD	HDF
Death	1	0
Peripheral ischemia	1	0
Intracerebral bleeding	0	1
Access problem	0	1
Severe hypertension	0	1

Number of patients.  
All were replaced by new subjects.

# Results: Dialysis data

	HD	HDF
Number of treatments (n)	520	520
Treatment time (minutes)	$265 \pm 27$	$267 \pm 28$
Pre-dialysis weight (kg)	$80.9 \pm 14.1$	$80.6 \pm 14.4$
Post-dialysis weight (kg)	$78.5 \pm 13.9$	$78.3 \pm 14.0$
Ultrafiltration volume (L)	$2.4 \pm 1.0$	$2.3 \pm 1.0$
Replacement volume (L)	0	$22.1 \pm 4.2$
Qb (ml/min)	$312 \pm 32$	$310 \pm 34$
Kt/V	$1.47 \pm 0.24$	$1.51 \pm 0.20$
Dialyzed blood volume (L)	$82.4 \pm 5.8$	$81.2 \pm 7.1$

Mean  $\pm$  SD

# Results: Dialysis related symptoms

	HD	HDF
Headache	5.0	6.0
Nausea	4.0	3.0
Vomiting	4.0	0.0
Dizziness	5.5	5.0
Thirst	4.5	5.5
Itching	4.0	4.0
Muscle cramps	4.0	3.0
Fatigue	11.0	11.0
Restless legs	4.5	3.0
Dyspnea	3.0	4.0
Sleep disturbance	4.5	8.0

Number of patients with VAS  $\geq 3$  during day 30 to 60

# Results: Quality of Life (IQOLA SF-36 questionnaire)

	HD	HDF
Physical Functioning	53 ± 26	50 ± 24
Role Physical	30 ± 36	26 ± 39
Bodily Pain	64 ± 28	68 ± 22
General Health	41 ± 21	41 ± 18
Vitality	51 ± 26	52 ± 27
Social Functioning	75 ± 24	64 ± 27 *
Role Emotional	60 ± 41	60 ± 45
Mental Health	75 ± 22	75 ± 18
Physical component summary	47 ± 14	46 ± 17
Mental component summary	65 ± 11	63 ± 10

Mean ± SD (mmHg) at day 60

\* p < 0.05

# Results: Intra-dialysis symptoms

	HD n = 520	HDF n = 520
Muscle cramp	79	60
Headache	40	45
Hypertension	9	4
Hypotension	28	32
Restless legs	10	19
Numbness	10	18
Nausea	6	3
Dizziness	5	3
Chest pain	3	3
Palpitations	1	5
Tinnitus	4	1
Angina pectoris	2	0
Itching	1	4
Dyspnea	2	1
Sweat	2	2
Vomiting	1	0
Epistaxis	1	0
Total	204	200

Number of events recorded by the dialysis nurse.

# Results: Blood pressure

	Pre-dialysis		Post-dialysis	
	HD	HDF	HD	HDF
<b>Systolic</b>				
Supine	157.5 ± 26.1	161.2 ± 29.9	157.1 ± 22.8	161.6 ± 25.1
Standing	151.1 ± 26.1	156.4 ± 31.1	137.9 ± 18.4	143.0 ± 24.3
<b>Diastolic</b>				
Supine	86.4 ± 10.8	88.9 ± 12.6	85.3 ± 10.3	86.8 ± 12.8
Standing	86.8 ± 12.6	90.1 ± 14.0 *	81.8 ± 9.5	85.1 ± 13.4

Mean ± SD (mmHg)

\* p < 0.05

# Results: Clinical Chemistry

	Day 0	Day 60	
	Baseline	HD	HDF
Hemoglobin (g/L)	116.1 ± 12.2	116.1 ± 8.4	115.1 ± 6.0
Mean corpuscular volume (x 10-15L)	97.1 ± 5.5	97.2 ± 5.7	98.0 ± 4.9
Leukocyte count (x 10⁹/L)	8.1 ± 2.5	7.0 ± 1.8 a**	7.1 ± 2.3 a**
Thrombocyte count (x 10⁹/L)	241 ± 76	234 ± 69	236.5 ± 83.1
s-sodium (mmol/L)	137.2 ± 3.2	137.3 ± 2.3	137.5 ± 2.4
s-potassium (mmol/L)	5.0 ± 0.9	4.9 ± 0.6	5.0 ± 0.8
s-calcium (mmol/L)	2.4 ± 0.2	2.4 ± 0.2	2.4 ± 0.4
s-phosphate (mmol/L)	2.0 ± 0.5	1.8 ± 0.4	1.7 ± 0.4
s-bicarbonate (mmol/L)	23.5 ± 2.0	24.2 ± 1.6	24.1 ± 2.3
s-creatinine (µmol/L)	748 ± 240	688 ± 213 a**	671 ± 192 a**
s-BUN before dialysis (mmol/L)	21.9 ± 5.8	18.1 ± 4.5 a**	17.3 ± 3.8 a***
s-albumin (g/L)	34.8 ± 3.2	36.0 ± 2.9	34.3 ± 2.6 b**
s-ferritin (µg/L)	302 ± 141	311 ± 126	253 ± 95
s-hsCRP (mg/L)	11.2 ± 12.2	9.8 ± 10.2	9.6 ± 11.1
s-β2microglobulin (mg/L)	30.6 ± 11.9	34.6 ± 17.0	23.7 ± 8.1 a**, b***

a = compared to baseline

b = compared to HD

\* p < .05

\*\* p < .01

\*\*\* p < .001

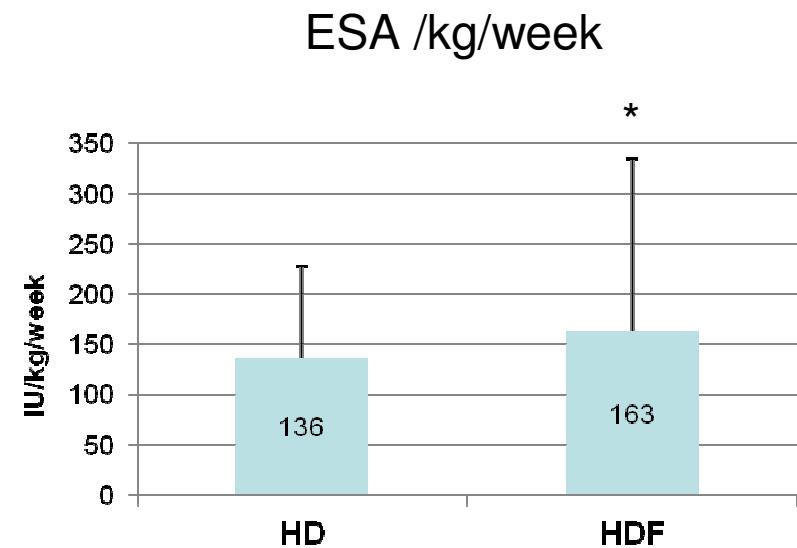
# Results: Oxidative stress, inflammation, iron metabolism

	HD	HDF
s-interleukin 6 (pg/ml)	$17.4 \pm 17.0$	$18.1 \pm 11.5$
s-MPO (ng/ml)	$90.1 \pm 76.8$	$93.4 \pm 59.9$
s-protein carbonyl (nmol/l)	$23.5 \pm 4.4$	$23.1 \pm 4.3$
s-BD-LDL ( $\mu$ M)	$44.4 \pm 13.8$	$41.1 \pm 13.3$
s-TEAC ( $\mu$ M Trolox)	$4.0 \pm 0.6$	$4.1 \pm 0.7$
s-hepcidin (nM)	$11.1 \pm 5.4$	$6.9 \pm 2.9$ **

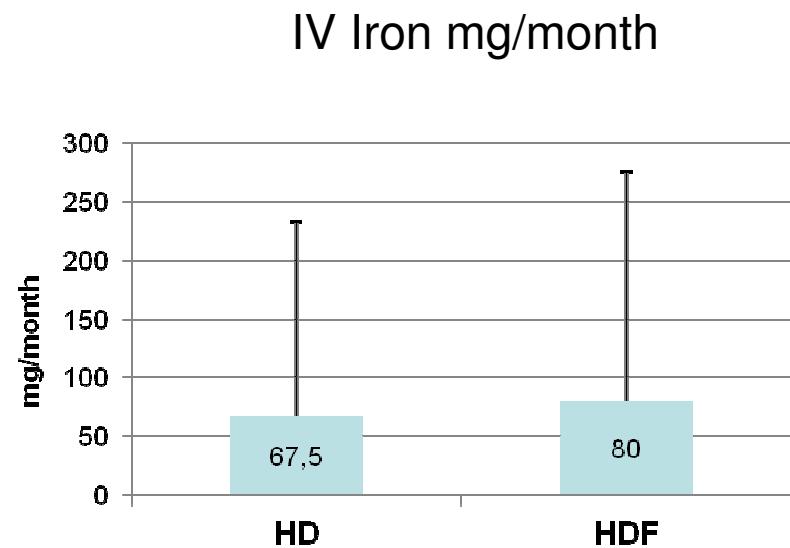
Mean  $\pm$  SD (mmHg)

\*\*  $p < 0.01$

# Results: ESA and IV iron consumption

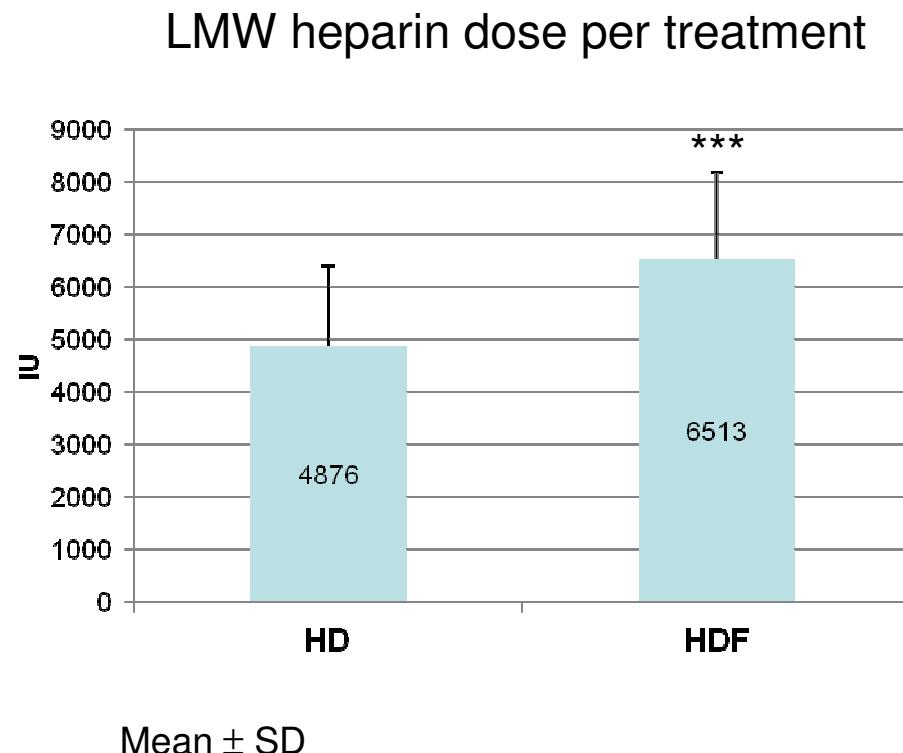


Median  $\pm$  SD  
Day 30 to 60



Median  $\pm$  SD  
Day 30 to 60

# Results: LMW heparin consumption



# Conclusions

- No significant differences:
  - Inter- and intra-dialysis symptoms/complications
  - QoL
  - General well being
  - Inflammation
  - Oxidative stress



# Conclusions

- Significant differences:
  - Blood pressure (higher with HDF)
  - Iron metabolism (signs of increased iron mobilization with HDF)
  - ESA dose (higher with HDF)
  - LMWH dose (higher with HDF)



**Original Paper**

# **Hemodiafiltration Improves Plasma 25-Hepcidin Levels: A Prospective, Randomized, Blinded, Cross-Over Study Comparing Hemodialysis and Hemodiafiltration**

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