FLUID OVERLOAD (FO), HYPERTENSION (HT) AND LEFT VENTRICULAR HYPERTROPHY (LVH) IN HEMODIALYSIS (HD) PATIENTS

The best way to solve a problem is to attack the cause

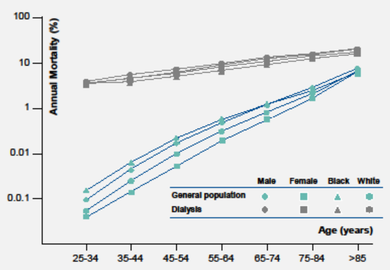
Diana Carretero-Dios*, J.Ignacio Merello-Godino**, J.Enrique Morán-Risco*, Sandra Castellano**

*Palma del Río Dialysis Centre. Córdoba (FMC Services Andalucia), Spain. **Medical Department. FMC Spain.*

INTRODUCTION & OBJECTIVES

Cardiovascular Mortality in End Stage Renal Disease (ESRD)

Foley et al. AJKD (1998) 32, Suppl 3; S112-S119

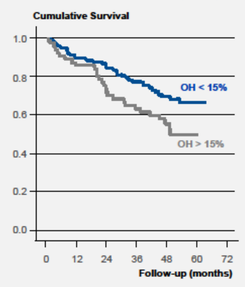


Cerasola et al. JNephrol 2011 ; 24(01): 1- 10

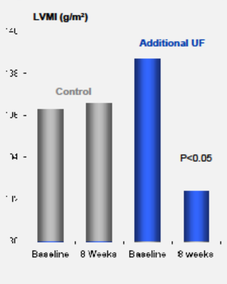
The Relative contribution of traditional and nontraditional CVD risk factors remains uncertain.
Definitive evidence on optimal intervention is lacking.

Epidemiology and pathophysiology of left ventricular abnormalities in chronic kidney disease: a review.
THOROUGH CRITICAL APPRAISAL

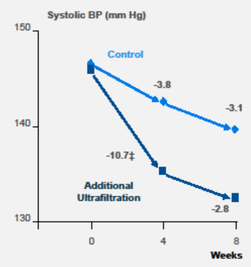
Wizemann et al. NDT (2009)



Agarwal et al. Am J Nephrol (2011)



Agarwal et al.Hypertension (2009)



Fluid Overload (FO) ► Eccentric LVH
Hypertension (HT) ► Concentric LVH

FO is an independent predictor of mortality	LVMI can be improved by reducing Dry Weight	BP control by DW adjustment

Accurate measurement of Hydration Status (HS) coud give us the KEY to obtain an objective CV Risk assessment in HD

FRESENIUS MEDICAL CARE

*BCM Body Composition Monitor

Better control of HT	Less intra-HD events	HT drugs reduction

Close attention to volume control has the potential to make a difference to the dismal CV mortality.
Agarwal et al, Hypertension, 2010: 56; 512-517

Aim Let us choose a cause to attack...

To investigate possible links between **Hydration State** (HS) measured by a Bioimpedance Spectroscopy (BIA) device, **BCM***, **Blood Pressure** (BP) and **LVH.**

METHODS

Cross-sectional study on 50 HD patients to study HS by BCM, BP and LVH links. 36 ♂ and 14 ♀, age 69±18 years HF-HD(*Helixone©,4008 FMC*), ≥3 ses/week (**719±126min**). HD-vintage was 34±41,7 months. ≤3 months on HD was defined **Incident. We considered OH/ECW, to assess HS.** Blood chemistries were collected the same HD session of BCM measurement. A 2-dimensional-guided **M-mode echocardiography** (ET) within the 2 weeks including BCM test. LVM calculations, according to the American Society of Echocardiography guidelines (ASE) , based on the inter-HD midweek days ET .

Statistical analysis

Results are expressed as **Mean±SD** , or **Percentages** in case of qualitative parameters. Variables relationships were studied with *Pearson's correlation coefficients* (significant level p<0.05). For independent samples Unpaired Student's t-test or non-parametrics (²square), as appropriate. ***Multiple stepwise linear regression*** was done and LV Geometry Remodelling Patterns (**RP**) as Dependent variable. HD-vintage,BP,and OH/ECW were Independent Variables

Main performed tests – Parameters assessment

M-mode ET

Inter-HD (midweek days)

LViDD	LV internal Diastolic Diameter
IVS	Interventricular Septum thickness
PWT	Diastolic Posterior Wall thickness

Blood chemistries

Inflammation	CRP, ERI*, Ferritine
Anemia	Hemoglobin Hematocrit
Nutrition	Albumin Creatinine

* Nespdose* 200/W/Hb/weight (UI/Week/Kg/gr/dl)

Fluid Status BCM

Pre-HD (mid-week HD session)

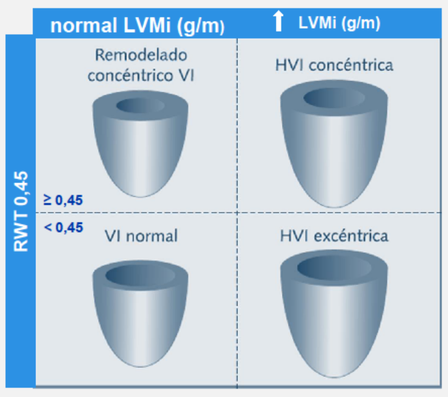
OH/ECW (%)	**Relative OverHydration**
Overhydrated (SH)	**OH/ECW≥15%**
Normohydrated (NH)	OH/ECW<15%

Clinical parameters

Anti-HT medication	Number of Drugs
intra-HD symptoms *Monthly register Euclid Score*	Number Seriousness (mild, moderate, severe)
Blood Pressure *Mean BP of the monthly office pre-HD monitoring*	**sBP** (Sistolic) **dBP** (Diastolic) **averageBP** (S+D)/2

HT ► avBP ≥ 110 mmHg

LVMi and Geometry Remodelling Patterns (RP)



LVM calculations

LVM according to ASE (***Deveraux*** [1],**indexed by height** (LVMi g/m).

LVH (sex-specific criteria)

LVMi ≥ 134 g/m (males)
LVMi ≥ 102 g/m (females).

LV RP:
Interactions among (**RWT**) [2]
Relative wall thickness –LVM.

[1] LVM=0,8 x [1,04 x (LViDD + IVSept + PWT)3 +(LViDD)3]+ 0,6.

[2] RWT = 2 x PWT/LViDD (normal < 0,45).

RESULTS High prevalence of LVH mostly Eccentric

HD vintage 34 ± 41 m **75% Prevalents**	OH/ECW 11,2 ± 8% **64% NH 36% SH**	avBP 97 ± 20 mmHg **70% Normal BP**	LVMi 156,5 ± 46,8 g/m **87% LVH**

Remodelling Patterns (RP) — **Concentric LVH 36%** — **Eccentric LVH 51%** — **Normal 13%**

Clinical Parameters in NH vs SH

variable	NH (64%)	SH (36%)	t	p
Status 1 Prevalent; 2 Incident	1,14 0,35	1,45 0,5	-2,69	0,009
HD-Vintage months	41,4 ± 42	20,4 ± 39	1,89	0,069

variable	NH (64%)	SH (36%)	²	p
Prevalents %	90	56	6,63	0,01

variable	NH (64%)	SH (36%)	t	p
sBP mmHg	127±29	140,16 ± 27	-1,5	ns
dBP mmHg	60±13	66,12 ± 14	-1,56	ns
avBP mmHg	93 ±19	105 ±18	-2,1	0,04
HT	1,31 0,46	1,30 0,47	0,043	ns

variable	NH (64%)	SH (36%)	²	p
HT %	30	34	0,002	0,99

variable	NH (64%)		SH (36%)		t	p
Anti-HT drugs 0:none; 1:one 2:≥two	0,06	0,2	0,65	0,87	-3,86	0,000
intra-HD symptoms	1,61	2,5	2,8	3,4	-1,48	0,145
Seriousness 0:asympt.; 1:mild; 2: moderate; 3:severe	0,44	0,6	0,9	1,01	-2,038	0,04

Geometry Remodelling Patterns (RP) and HS

variable	NH (64%)	SH (36%)	t	p
LVMid g/m	158,5 ± 33	161,2 ± 67	-0,20	0,842
LVMip g/m	189,2 ± 41	192,7 ± 83,5	-0,21	0,833
+LVH/-LVH	1,92 0,28	1,75 0,44	1,72	0,118

variable	NH (64%)		SH (36%)	²	p
%LVH	97%		83%	3,52	0,095
RP	43%	**Concentric**	18%	5,57	0,06
	54%	**Eccentric**	65%		

KEY MESSAGES

NH had longer HD-vintage and lower BP level

Increased anti-HT and Symptoms seriousness in SH, mostly Incidents

Associations OH/ECW - LViDD vs BP with PWT and IVS
OH/ECW and BP lead to different *LV RP*

Correlations of OH/ECW

Variable	Coef. Pearson	p
avBP	0,248	0,068
HDvintage	-0,162	ns
Albumin	-0,261	0,05
Hb	-0,270*	0,046
logCRP	0,277*	0,048
ERIndex	0,512**	0,000
Eccentric	0,385**	0,003
LViDD	0,283*	0,04
RWT	-0,348*	0,01
LVMi	0,013	ns 0,928

BP and LV geometry

PWT

Variable	Coef Pearson	p
sBP	0,282	0,043
avBP	0,289	0,038

RWT

sBP	r=0,272	p=0,05

HD-Vintage

avBP	-0,382**	0,004
sBP	-0,332*	0,013
dBP	-0,257	0,05

HD-vintage was associated with lower BP, maybe due to better DW adjustment . This is in line with the observation of the **Anemia** *(Hb:r=0,29; p=0,03)*, **Inflammation** *(ER index: r=- 0,291; p=0,03)* and **Nutrition** *(Creatinine: r=0,44; p=0,001)* **Status improvement with the increase in HD age.**

FO, wich itself is cause of both HT and LVH may be the cause to attack ...

CONCLUSION

Multiple stepwise linear regression. RP as Dependent Variable

Model		Unstandardized Coefficients B	SE	Standardized Coefficients Beta	t	P-value
1	(Constant)	1,494	0,156		9,60	**0,000**
	OH/ECW	**0,031**	**0,012**	**0,353**	**2,66**	**0,012**
	HD-vintage			0,176	1,33	*0,188*
2	(Constant)	2,285	0,406		5,617	0,000
	OH/ECW	0,035	0,011	0,403	3,092	**0,003**
	sBP	-0,006	0,003	-0,273	-2,1	**0,041**
	HD-vintage			0,106	0,786	*0,436*

OH/ECW is associated with Eccentric LVH while BP leads mostly to Concentric changes. If HT is present, OH/ECW influence on RP is even higher.

HD-vintage doesn´t change any of these links

OH/ECW is the most important factor leading to RP changes, even more than BP, possibly because DW control improves BP. HD-vintage doesn´t change OH/ECW or BP effect on RP

In HD, BCM, may be the KEY to control HS and BP. Consequently, CV *morbidity and mortality* could significantly be Improved.

REFERENCES

Association between ECW, left ventricular mass and hypertension in HD patients. *Nephrol Dial Transplant (2003) 18; 2332-2338. Fagugli et al.*

Importance of Whole-Body Bioimpedance Spectroscopy for the Management of Fluid Balance. *Blood Purif 2009; 27:75–80. Wabel P. et al.*

Towards improved CV management: the necessity of combining BP and FO. *Nephrol Dial Transplant (2008) 23: 2965–2971. Wabel P. et al.*

The mortality risk of overhydration in haemodialysis patients. *Nephrol Dial Transplant (2009) 24: 1574–1579. Wizemann V. et al.*

50ERA-EDTA

498--MP

Cardiovascular complications in CKD 5D

Diana Carretero Dios

DOI: 10.3252/pso.eu.50era.2013

Poster presented at: ERA-EDTA 50th Congress Istanbul, Turkey May 15-21, 2013

PosterSessionOnline.com