BIO-IMPEDANCE SPECTROSCOPY-MEASURED LEAN TISSUE MASS AND SURVIVAL IN A LARGE INTERNATIONAL HAEMODIALYSIS POPULATION

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Introduction

Body mass index (BMI) is inversely associated with mortality in haemodialysis (HD) patients. However, the relative contribution of body fat and lean tissue is not clear cut. Using a large international HD database we examined the impact of body composition on survival using bio-impedance spectroscopy (BIS)-measured fat tissue index (FTI) and lean tissue index (LTI).

Methods

We obtained BIS measurements (BCM - Body Composition Monitor, Fresenius Medical Care) from patients receiving HD in a large dialysis network (NephroCare, Fresenius Medical Care) between January 2010 and April 2014. Only those patients in whom at least one BIS measurement was available within the first 90 days of starting HD were selected. FTI and LTI were derived by dividing fat and lean tissue mass by height squared. Association between quartiles of mean FTI and LTI, and survival was assessed by Kaplan-Meier survival analysis.

Table 1: Patient characteristics by quartiles of Fat Tissue Index (n=31,955)

	Q1 (n=7933)	Q2 (n=7934)	Q3 (n=7933)	Q4 (n=7934)
FTI (Kg/m^2)	**5.6 ± 2.4**	**10.3 ±1.0**	**14.0 ± 1.2**	**21.8±14.1**
Age (years,SD)	54 ± 18	62 ± 16	65 ± 14	65 ± 13
Gender (% M)	72	67	60	40
BMI (Kg/m^2)	21 ± 3	24 ± 3	27 ± 3	33 ± 5
Diabetes (%)	18	28	35	46
CHF (%)	11	14	16	18
PVD (%)	6	9	11	10
CAD (%)	4	5	7	6
Kt/V	1.5 ± 1.3	1.5 ± 0.7	1.5 ± 0.6	1.5 ± 1.6
BPsys (mmHg)	141 ± 18	139 ± 18	138 ± 18	139 ± 18
BPdia (mmHg)	76 ± 11	73 ± 11	71 ± 11	71 ± 10
Albumin (g/l)	3.7 ± 0.5	3.8 ± 0.5	3.8 ± 0.4	3.8 ± 0.4
Hb (g/dl)	10.4 ± 1.5	10.7 ±1.4	10.8 ± 1.3	10.8 ± 1.2
UFV (litre)	2.1 ± 0.8	2.2 ± 0.8	2.2 ± 0.8	2.3 ± 0.8
FO Pre (litre)	2.5 ± 2.3	2.3 ± 1.9	2.0 ± 1.7	1.6 ± 1.8
FO post (litre)	0.4 ± 2.3	0.1 ± 1.9	-0.2 ± 1.7	-0.8 ± 1.8

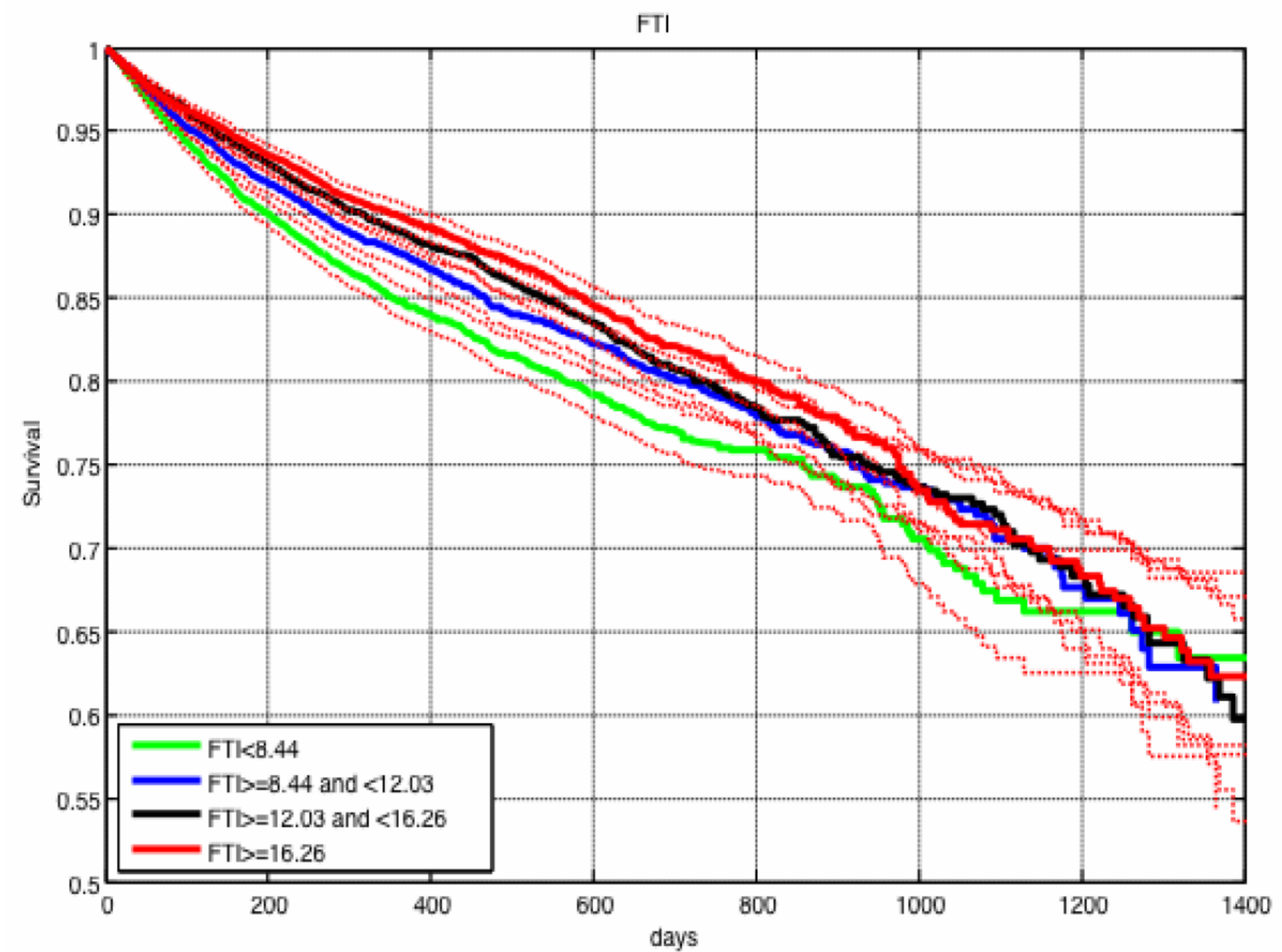### Table 2: Patient characteristics by quartiles of Lean Tissue Index(n=31,955)

	Q1 (n=7933)	Q2 (n=7934)	Q3 (n=7933)	Q4 (n=7934)
LTI (Kg/m^2)	**9.2 ± 1.2**	**11.5 ± 0.5**	**13.5 ± 0.6**	**17.6 ±12.5**
Age (years, SD)	68 ± 14	63 ± 15	60 ± 15	53 ± 15
Gender (%M)	35	51	68	85
BMI (Kg/m^2)	26 ± 5	26 ± 5	26± 5	27± 5
Diabetes (%)	39	34	31	23
CHF (%)	19	16	14	11
PVD (%)	10	11	9	6
CAD (%)	6	6	6	4.
Kt/V	1.7 ± 1.7	1.5 ± 0.4	1.5 ± 0.7	1.4 ± 1.3
BPsys (mmHg)	136 ± 20	138±18	140 ± 17	143 ± 16
BPdia (mmHg)	69 ± 11	71 ± 11	74± 10	77 ± 10
Albumin (g/l)	3.6 ± 0.5	3.7 ± 0.4	3.8 ± 0.4	3.9 ± 0.4
Hb (g/dl)	10.6 ± 1.4	10.6 ± 1.3	10.7 ± 1.4	10.7 ± 1.4
UFV (litre)	2.0 ± 0.7	2.2 ± 0.8	2.3 ± 0.8	2.4 ± 0.9
FO Pre (litre)	1.9 ± 1.6	2.2 ± 1.8	2.3 ± 2.0	2.0 ± 2.
FOpost (litre)	-0.1 ± 1.7	0.0 ± 1.8	0.0 ± 2.0	-0.3 ± 2.3

Fig 1: Survival by quartiles of Fat Tissue Index

FTI
- FTI<8.44
- FTI>=8.44 and <12.03
- FTI>=12.03 and <16.26
- FTI>=16.26

Results

31,955 incident HD patients from 25 countries (>70% European), mean age 61 years, 59% male, mean BMI 26.5 Kg/m2 and 31% diabetic, were studied. The mean follow-up period was 392 days and the mean number of BCM measurements per patient was 10. Tables 1 and 2 show patient characteristics by quartiles of FTI and LTI. Survival progressively reduced from the highest to the lowest quartile of LTI (Fig 2). Separation of the survival curves was much narrower for FTI (Fig 1).

Fig 2: Survival by quartiles of Lean Tissue Index

LTI
- LTI<10.63
- LTI>=10.63 and <12.51
- LTI>=12.51 and <14.66
- LTI>=14.66

Conclusion

This large study of incident HD patients shows that the LTI is a much more informative predictor of all-cause mortality than the FTI. It underlines the need for effective nutrition and exercise management strategies in the HD population to preserve lean body mass with a view to improving survival.

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