How much increase in Malnutrition-Inflammation Score (MIS) really reflects a progression toward malnutrition?

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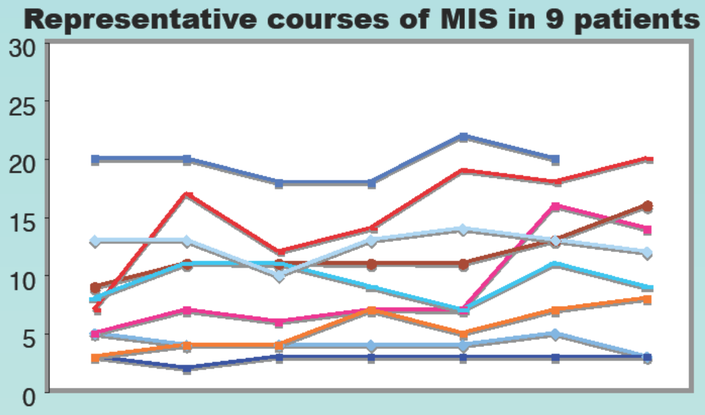
INTRODUCTION

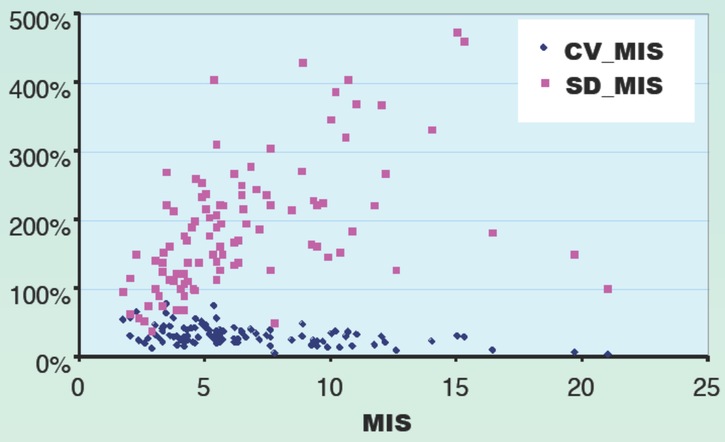
•Malnutrition, or protein-energy wasting (PEW), is regarded to be one of the most common morbidity, which is associated with high mortality, in dialysis population.
•Malnutrition-Inflammation Score (MIS), developed by Kalantar-Zadeh (2001), is composed of 7 factors (dry weight loss, food intake, GI symptoms, physical activities, comorbidities, fat and muscle) derived from subjective global assessment (SGA) and additional 3 objective factors (body mass index, serum albumin and total iron binding capacity). MIS has been regarded to be one of the most efficient way to detect malnourished dialysis patients.
•However, MIS fluctuates over a period of time in a single patient. It is unknown how much increase in MIS actually reflects a progression toward malnutrition.

Representative courses of MIS in 9 patients



METHODS

•Study population:
–A retrospective cohort study
–MIS has been performed semiannually by dialysis nurses to all the patients on maintenance hemodialysis in a single dialysis center, since october 2010.
–The patient who had at least 3 measurements until december 2013 were included in the present analysis.
•MIS:
–Each 10 component of MIS has 0-3 points with a higher point suggesting toward malnutrition;
–MIS is calculated as a sum of those components, with a minimum (best) score of 0 and a maximum (worst) score of 30.
•Fluctuation of MIS:
–Evaluated by standard deviations (SDs) of serial MIS measurements in each patient.
–Background clinical factors which might influence MIS fluctuation were analyzed.
•Statistical analysis:
–StatView 5.0 (SAS Institute Inc.) for Macintosh.



RESULTS

•Nutritional status of the population (Table 1):
–A total of 104 patients (age of 67.7±13.1 years, m±SD, M:F = 69:35) were included in the analysis; 6 died and 5 transferred to other dialysis clinics between november 2011 and march 2014
–MIS: 6.49±3.70
–Standardized triceps skin fold thickness (TSF): 94.4±39.2%
–Standardized arm muscle area (AMA): 99.4±20.8%.
•Multivariate stepwise analysis (Table 2):
–MIS fluctuated significantly if background status has less dry weight and lower serum albumin (P<0.001)
–Supports that MIS fluctuation might reflect malnutrition at least partially.

Table 2 Correlation with standard deviation of MIS

	univariate		multivariate		
	adj-R2	P	B	SE	β
age	0.046	0.017			ns
DW	0.164	<0.0001	-0.03	0.01	-0.38
%TSF	0.063	<0.0001			ns
%AMA	0.025	0.06			ns
height	0.036	0.03			ns
BMI	0.126	0.0001			ns
Alb	0.07	0.0041	-0.39	0.19	-0.19
TIBC	0.055	0.0098			

•In patients with MIS less than 8 (n=78), i.e., those regarded to be without PEW
–SDs of MIS were 1.62±0.71, significantly less than those in patients with MIS 8 or higher (n=26, 2.66±1.11, P<0.001; Table 1).
–Considering that 2SDs cover 95%, which most-likely within range of error, an increase in MIS larger than 3.24 (=1.62 x 2) could be regarded as a progression toward PEW.

Table 1

		All n=104	MIS >= 8 n=26	MIS < 8 n=78	P
MIS		6.49 ± 3.70	11.78 ± 3.28	4.73 ± 1.48	<0.001
SGA		4.55 ± 2.68	8.00 ± 2.77	3.40 ± 1.31	<0.001
Alb	*g/dL*	3.66 ± 0.32	3.47 ± 0.35	3.73 ± 0.28	<0.001
%TSF		94.4% ± 39.2%	64.0% ± 24.9%	104.5% ± 37.9%	<0.001
%AMA		98.5% ± 22.9%	79.1% ± 22.9%	104.9% ± 19.1%	<0.001
Dry weight (max)	*kg*	57.5 ± 12.5	44.6 ± 7.1	61.8 ± 10.9	<0.001
SD of MIS		1.88 ± 0.94	2.66 ± 1.11	1.62 ± 0.71	<0.001
SD of SGA		1.56 ± 0.77	2.11 ± 0.93	1.37 ± 0.61	<0.001
SD of Alb	*g/dL*	0.41 ± 0.26	0.46 ± 0.28	0.40 ± 0.26	0.31
SD of %TSF		33.0% ± 18.2%	27.1% ± 15.5%	35.0% ± 18.7%	0.057

•This hypothesis was supported by the following findings:
–The patients with an increase in MIS from an average of the previous MIS by 3.5 or more (n=15) had …
–significantly higher MIS and progressive decline in arm muscle area, compared with those whose increment were less (n=89; Table 3).

Table 3 Fluctuating-MIS patients has higher MIS and are losing arm muscle

(average ± SD)	>=3.5 (n=15)	< 3.5 (n=89)	P
MIS	8.27 ± 5.42	6.19 ± 3.27	0.043
SGA	5.87 ± 3.95	4.32 ± 2.36	0.037
%TSF	90.1% ± 59.5%	95.1% ± 35.0%	0.65
%AMA	94.5% ± 27.2%	99.1% ± 22.2%	0.47
change in %TSF	-10.6% ± 24.5%	-3.4% ± 36.3%	0.46
change in %AMA	-7.9% ± 9.8%	2.4% ± 14.8%	0.011

References

•**Kalantar-Zadeh K et al, Am J Kidney Dis. 2001;38(6):1251-63**
MIS was introduced.
•**Kalantar-Zadeh K et at, Nephrol Dial Transplant. 2004;19:1507-1519**
"The MIS appears to be a useful, short- term tool to risk-stratify MHD patients" in a 378 HD patient cohort study.
•**Rambod M et al, Am J Kidney Dis. 2009;53:298-309**
"Each 2-unit increase in MIS was associated with a 2-fold greater death risk, ie, adjusted death hazard ratio of 2.03" in 809 HD patients during a max-5-year followup.
•**Ho LC et al, Blood Purif. 2010;29:308-16**
"For every unit increase in the MIS, the adjusted hazard ratio for mortality was 1.177" in 141 PD patients in Taiwan, for up to 18 month followup.

CONCLUSION

Increase in MIS by 3.5 or more from an average of the previous MIS measurements is likely to represent a true progression toward malnutrition rather than a measurement error.

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