COMPARISON OF LUNG ULTRASOUND WITH CARDIAC ECHOCARDIOGRAPHY IN CHRONIC HEMODIALYSIS PATIENTS

Morikuni Nishihira[1], Taku Inoue[2,4], Toru Hanashiro[1], Kiyomitsu Nagayama[1], Masato Oroku[1], Tasuku Kikumura[1], Takuya Sekiguchi[1], Shigetomo Terukina[1], Koichi Yahagi[1], Kunihiro Shimoji[1], Yoshiki Shiohira[1], Kunitoshi Iseki[1,3,4]

1)Department of Nephrology, Tomishiro Central Hospital, Okinawa, Japan
2)Department of Cardiology, Nanbu Hospital, Okinawa, Japan
3)Clinical Research center, Tomishiro Central Hospital, Okinawa, Japan
4)Okinawa Heart and Renal Association, Japan

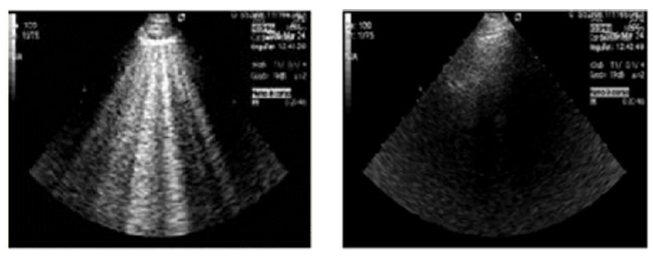
Back ground

Body fluid control is a critical issue for the prognosis for the chronic HD patients. Optimal body fluid status is usually determined through various clinical indices such as physical examination, cardio-thoracic ratio, cardiac ultrasound and bio-markers. Lung ultrasound is a novel and validated technique for estimating the extravascular lung water. Several reports demonstrated the prognostic significance of lung ultrasound in asymptomatic HD patients. In Japan, however, few data are available demonstrating the relationship between body fluid status assessed by lung ultrasound and prognosis of the chronic HD patients. We aimed to compare the lung ultrasound with cardiac ultrasound for assessing the body fluid status in chronic HD patients and to confirm the clinical utility of this new technique.

METHODS

A total of 102 consecutive chronic HD patients (age 63.5 ± 13.0 years, 54 females) were enrolled from February to December, 2015 after obtained informed consent. All patients were evaluated with two-dimensional and Doppler echocardiography and lung ultrasound with comet score assessment. A comet score was obtained by summing the number of comets from each of the scanning spaces in the anterior right and left hemithoraxes, from the second to fifth intercostal spaces (Figure, Table). The comet score was measured both before and after HD session.

■ Ultrasound lung comet by chest sonography [1)]



■ How to score and report lung ultrasound finding

Mid-axillary	Anterior axillary	Mid-clavear	Para-sternal	Intra-costal space	Para-sternal	Mid-clavear	Anterior axillary	Mid-axillary
				2				
				3				
				4				
				5				

RESULTS

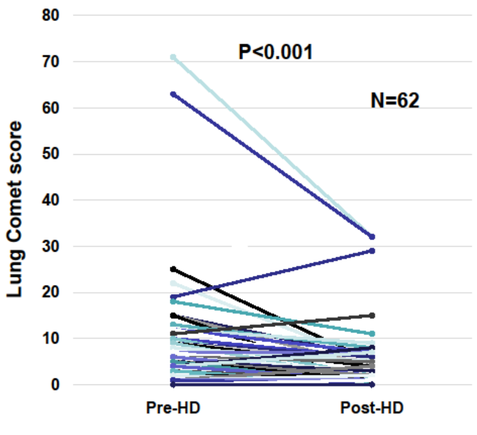
The main clinical data of the 81 patients are reported in the Table. The duration of HD was 104 (78) months, 67% of them were diagnosed as diabetes, and dry weight level was 58.8 (14.1) kg. A single HD session reduced 3.5 (1.3) % of body weight, comet score from 8.9 (12.6) to 4.8 (6.6). Patients were divided into two categories using the average comet score of post HD session as the cut off level. A total of 37 patients had the comet score with 5 or more at the post HD session, and 65 patients with less than 5. Those patients with the comet score of 5 or more had significantly higher levels of left atrial dimension (39 vs. 36, P <0.05), left atrial volume index (64 vs. 55, P <0.05), E / e' (17 vs. 15, P <0.05), and cardio thoracic rate (54 vs. 50, P <0.05), and likely to had higher levels of serum BNP compared those patients with the comet score of less than 5. However, there was no difference in the % ΔBW, left ventricular dimension, ejection fraction, and IVC diameter between the two patients categories.

■ Demographic, somatometric, and clinical characteristics in the study population and patients divided according to Comet Scores after HD

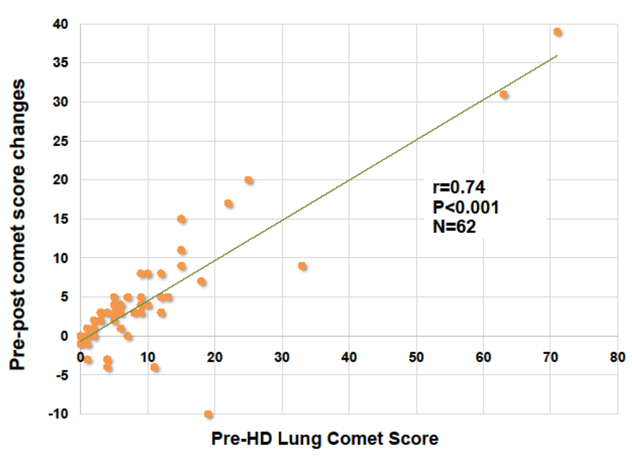
	All (n=102)	< 5 (n=65)	≧5 (n=37)	P value
Age, years	63.5 ± 13.0	61.2 ± 13.5	67.6 ± 11.1	0.02
Dialysis vintage, months	104 ± 78	107 ± 73	99 ± 87	NS
Dry weight, kg	58.8 ± 14.1	59.3 ± 14.2	57.3 ± 14.0	NS
BMI, kg/m2	23.2 ± 4.5	23.1 ± 4.3	23.3 ± 5.0	NS
%ΔBW, %	3.7 ± 1.4	3.7 ± 1.5	3.6 ± 1.3	NS
Male sex, n (%)	55 (54)	37 (57)	18 (49)	NS
Diabetes, n (%)	68 (67)	42 (65)	26 (70)	NS
Smoker, n (%)	32 (31)	17(26)	14 (41)	NS
Systolic blood pressure, mmHg	155 ± 21	157 ± 20	153 ± 23	NS
Diastolic blood pressure, mmHg	78 ± 14	80 ± 12	75 ± 15	0.05
Heart rate, beats/min	72 ± 11	73 ± 11	70 ± 12	NS
Hemoglobin, g/dL	11.2 ± 1.1	11.2 ± 1.1	11.2 ± 1.1	NS
Albumin, g/dL	3.7 ± 0.4	3.7 ± 0.4	3.6 ± 0.4	NS
Phosphate, mg/dL	5.0 ± 1.4	5.1 ± 1.6	4.8 ± 1.2	NS
Cholesterol, mg/dL	154 ± 31	154 ± 31	154 ± 32	NS
CRP mg/dL	0.5 ± 1.0	0.5 ± 0.9	0.7 ± 1.1	NS
Glycoalbumin (GA), %	19.1 ± 6.3	18.3 ± 5.7	20.4 ± 7.2	NS
BNP, pg/ml	257 ± 335	213 ± 274	335 ± 415	0.08
CTR, %	51.4 ± 5.2	49.9 ± 4.7	54.0 ± 5.1	0.01
Ⅲ-Ⅳ NYHA class, n (%)	6 (6)	4 (6)	2 (5)	NS

Data are expressed as mean ± SD, median and interquartile range, or percent frequency as appropriate.

■ Individuals Comet Score



■ Changes in Comet Score by HD



■ Echocardiographic Data exmamined after HD

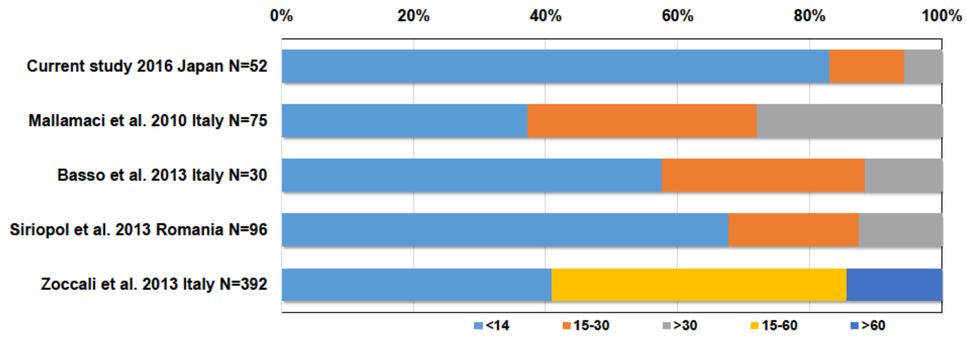
	All (n=102)	< 5 (n=65)	≧5 (n=37)	P value
LAD, mm	37 ± 6	36 ± 5	39 ± 6	0.04
LA volume, ml	58 ± 23	55 ± 20	64 ± 27	0.05
LA volume index, ml/m2	37 ± 15	33 ± 13	42 ± 16	<0.001
IVS, mm	10 ± 2	10 ± 2	10 ± 2	NS
LVDd, mm	48 ± 5	47 ± 4	50 ± 6	NS
LVDs, mm	31 ± 5	30 ± 5	31 ± 6	NS
EF, %	66 ± 10	65 ± 11	67 ± 9	NS
DcT, sec	251 ± 100	231 ± 61	289 ± 138	<0.001
E/e'	16 ± 9	15 ± 9	17 ± 7	0.02
IVC, mm	12 ± 4	13 ± 3	11 ± 4	0.01

Data are expressed as mean ± SD, median and interquartile range, or percent frequency as appropriate.

DISCUSSION

1. Various predictors of cardiac preload such as LA volume index, E/e' and Bio-makers(serum BNP, hANP) have reported for diastolic heart failure. In addition to above factors, comet score may be useful suggesting diastolic cardiac preload in HD patients.
2. As a whole, the volume status was excellent compared to other reports in our study. The comet score has been reported as a strong predictor of death and cardiac events. Further follow-up study is needed to prove the predictive value in our study.

■ International Comparison of lung comet score in HD patients



CONCLUSIONS

Comet score may be useful for body fluid volume assessment in HD patients. Future study is necessary to prove the prognostic value of comet score.

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