# TITLE

# Changes in body fat and lean mass after introduction of hemodialysis

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## Background

- Skeletal muscle atrophy in HD patients contribute to their poor exercise tolerance. The application of an exercise training rehabilitation program improved muscle atrophy. It is important to know the change in body lean mass in hemodialysis patients. We presented fat mass gradually increases in the first 3 years of hemodialysis and decreases thereafter. But there was no tendency of change in the lean body mass index for 180 months（Fig 1. AJKD 41, S137-141, 2003）. There were negative correlation between HD duration and both body mass index and lean body mass index. But there was no correlation between HD duration and fat mass index (Fig 2)
- As they were cross-sectional studies, we did a ten years follow up study to know the real changes.

## Methods

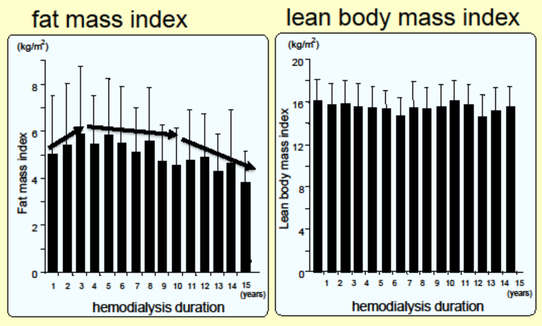
•Forty seven hemodialysis patients (27 men and 20 women;
•mean age 56.1±10.6 years) with ten years follow up data
•of dual x-ray absorptionmetry (DXA) from the beginning of
•HD were enrolled. Body fat mass and lean body mass were
•determined by DXA (QDR-4500; Hologic Inc, Waltham,MA)
•(Fig 3).

Table 1. Clinical Characteristics,
Body Fat Mass and Lean Body Mass of the Study Patients (n=47)

| | | |
|---|---|---|
| Age (y) | 56.1±10.6 | |
| Male/female | 27/20 | |
| DM/nonDM | 12/35 | |
| Body weight (kg) | 53.0±10.2 | |
| Body mass index (kg/m2) | 20.7±3.5 | |
| Fat mass (kg) | 11.0±6.5 | |
| Fat mass index (kg/m2) | 4.5±3.0 | (5.8±2.6) |
| Lean body mass (kg) | 40.1±8.4 | |
| Lean body mass index (kg/m2) | 15.6±1.9 | (17.1±1.3) |
| Right leg LBM (kg) | 6.0 ±1.4 | |

( ) : healthy Japanese control group (n=164, 52±9.1 years old)

**Fig1. Fat mass index and lean body mass index** (n=561)
Measured by dual x-ray absorptionmetry in each year of hemodialysis




(Mean ±SD)

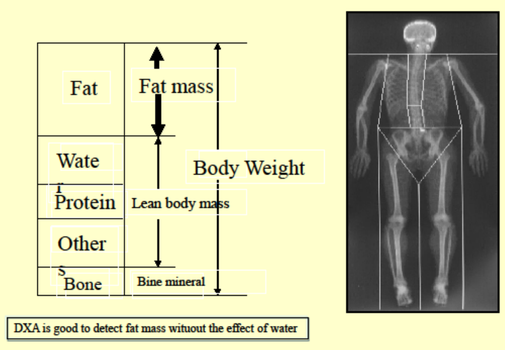
Ishimura E, et al. Am J Kidney Dis 41 Suppl 1,S137-141, 2003

Fig 2. Univariate predictors of death in the hemodialysis cohort

| | BMI | | FMI | | LMI | |
|---|---|---|---|---|---|---|
| | r | P | r | P | r | P |
| Age | −0.020 | 0.58 | 0.048 | 0.71 | −0.081 | 0.02 |
| HD duration | −0.146 | <0.01 | −0.057 | 0.10 | −0.137 | <0.01 |
| Systolic BP | 0.028 | 0.44 | −0.146 | <0.01 | 0.201 | <0.01 |
| Diastolic BP | 0.049 | 0.17 | −0.098 | <0.01 | 0.177 | <0.01 |
| Creatinine | 0.236 | <0.01 | 0.047 | 0.18 | 0.379 | <0.01 |
| Albumin | 0.046 | 0.20 | −0.011 | 0.77 | 0.074 | 0.04 |
| Cholesterol | 0.054 | 0.12 | 0.216 | <0.01 | −0.167 | <0.01 |
| Calcium × phosphate | 0.030 | 0.40 | 0.017 | 0.63 | 0.022 | 0.54 |
| Hematocrit | 0.018 | 0.61 | 0.028 | 0.43 | −0.007 | 0.85 |
| Log CRP | −0.010 | 0.78 | −0.001 | 0.98 | −0.012 | 0.73 |

Kakiya R, et al. Kidney International 70, 549-556, 2006

Fig 3. Body composition by dual x-ray absorptionmetry (DXA)




DXA is good to detect fat mass wituout the effect of water

Br J Radiol. 1992; 65: 895-900; Am J Kidney Dis 2000; 35[Suppl 2]:S34

Fig 4. Body weight change

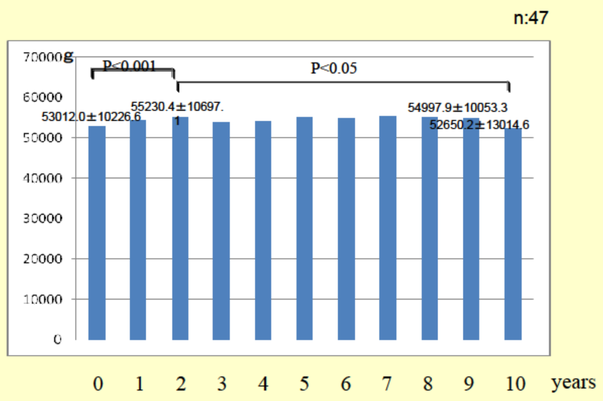



Fig 5. Total fat mass chnage

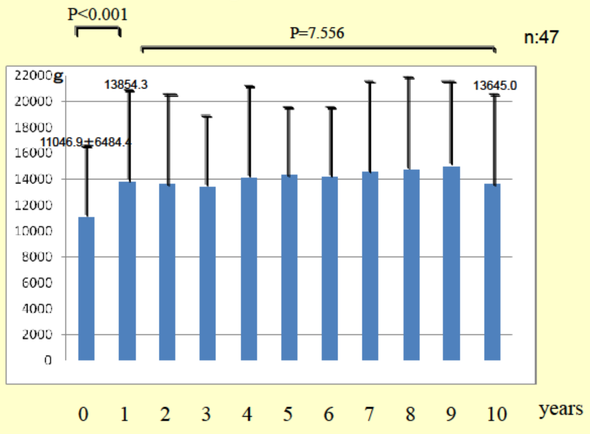



Fig 6. Total lean mass change

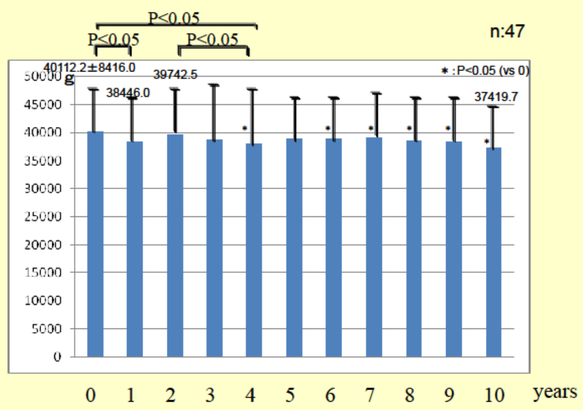



Fig 7. Each right leg lean mass change

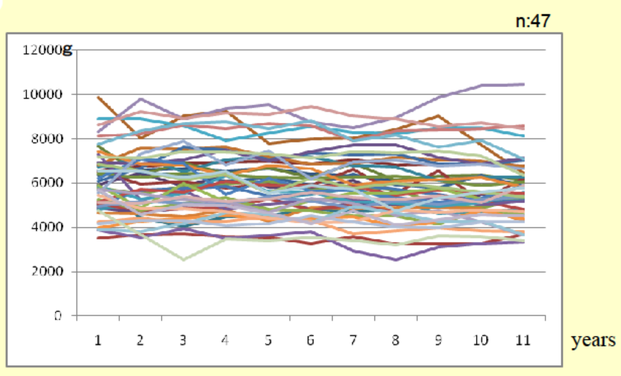
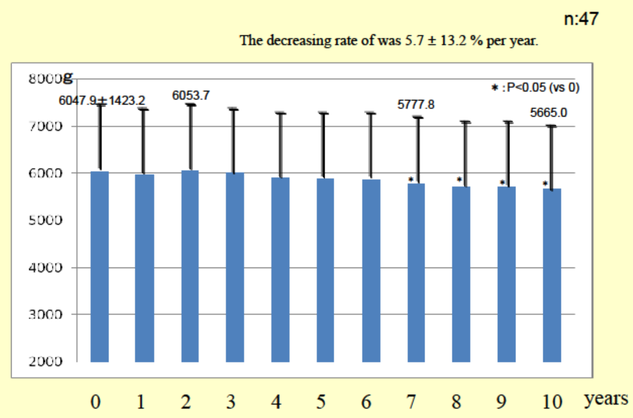



Fig 8. Right leg lean mass change




## Results

In baseline chracteristics, the body fat mass index was 4.5 ± 3.0 and the lean body mass index was 15.6 ± 1.9 (Table 1). Body weight increased in the first 2 years of hemodialysis from 53.0 ± 10.2 to 55.2 ± 10.7 kg. And it decreased 52.6 ± 13.0 kg in the next 8 years (Fig.4). Total fat mass increased in the first years from 11.05 ± 6.48 to 13.85 ± 7.29 kg and has no change in the left 9 years (Fig 5). Total lean mass decreased in the first year from 40.1 ± 8.4 to 38.4 ± 8.5 kg and returned in the next year to 39.7 ± 8.6 kg, and it gradually decreased after 4 years of HD to 37.4 ± 9.6 kg at the end of 10 years (Fig 6). Right leg lean mass decreased in the 7 years from 6.05 ± 1.42 to 5.78 ± 1.52 kg and it was 5.67 ± 1.44 kg at the end of 10 years (Fig 8). The decreasing rate of the right leg lean mass was 5.7 ± 13.2 % per year (Fig 8).

## Discussion

The term uremic myopathy has been used loosely to describe the skeletal muscle abnormalities in uremic patients. Aging is associated sarcopenia (muscle wasting) and an increase in the prevalence of chronic kidney disease (CKD), which accelerates the physiological muscle wasting.

Muscle strength is an important determinant of physical performance and ability to live independently in geriatric population. Patients who receive dialysis are weak compared with healthy sedentary control subjects. Recently, interventions during hemodialysis sessions have become more popular and have been shown to be safe.

To know the natural decrease rate of muscle mass is important. Right leg lean mass decreasing rate in ten years was 5.7 ± 13.2 %. But we should remind this study patients mean age was 56.1.

## Conclusion

Body weight increases in the first 2 years because of the increase of fat mass. Total lean mass decreases after 4 years of HD.

## CONCLUSIONS

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