# A Six-hour Hemodialysis Without a Significant Increase in Dialysis Dose, as Judged by Kt/V, Can Reduce the Dosage of Erythropoietin

Department of Kidney Center, Kouzenkai-Maeda Hospital

Atsuhiro Maeda

# Background

Inadequate dialysis is a known risk factor for resistance to erythropoietin (EPO) therapy. ※1~5

There is no consensus about the relationship between hemodialysis (HD) time and EPO dosage.


※1 Locatelli et al : Semin Nephrol 26 : 269-274 , 2006

※2 Movilli et al : J Nephrol 16 : 546 – 551 , 2003

※3 Movilli et al : Nephrol Dial Transplant 16 : 111 – 114 , 2001

※4 Gawade et al : Clin J Am Soc Nephrol 5 : 576 – 581 , 2010

※5 Katzarki et al : Nephrol Dial Transplant 14 : 369 – 375 , 1999

# Methods ①

We conducted a cross-sectional study on a total of seventy-eight HD patients with diabetes.

Subjects were recruited from three outpatient HD facilities in Japan.

At one facility, dialysis time was six hours (n=38) and at the other two facilities the dialysis time was four hours (n=40).

# Methods ②

The patients that participated in the study were at least twenty years of age and had undergone maintenance HD three times a week for at least six months.

Patients who have had any blood loss, blood transfusions, hospitalizations, or infections occurring within six months preceding the study were excluded.

# Results ①

| | 4-Hour HD | 6-Hour HD | P-Value |
|---|---|---|---|
| Age (years) | 65.5 | 67.2 | 0.48 |
| Length of Treatment (years) | 5.2 | 5.0 | 0.81 |
| Male (%) | 62.5 | 71.1 | 0.47 |
| Hemoglobin (g/dL) | 11.2 | 11.0 | 0.43 |
| Ferritin (ng/mL) | 179.8 | 172.0 | 0.84 |
| EPO Dosage (U/week) | 5375.0 | 3111.8 | 0.001 |

# Results ②

| | 4-Hour HD | 6-Hour HD | P-Value |
|---|---|---|---|
| Albumin (g/dL) | 3.7 | 3.8 | 0.28 |
| C-Reactive Protein (mg/dL) | 0.4 | 0.4 | 0.57 |
| Intact Parathyroid Hormone (ng/mL) | 135.8 | 114.3 | 0.42 |
| Quantity of Blood Flow (mL/minute) | 194.9 | 188.4 | 0.23 |
| Kt/V | 1.4 | 1.5 | 0.36 |
| Membrane Surface Area ($m^2$) | 1.6 | 1.1 | 0.001 |

# Multiple Regression Analysis with Weekly EPO Dose as Dependent Variable

| | Coefficient | Standard Error | T-Statistic | P-Value* |
|---|---|---|---|---|
| Age | 24.4 | 32.4 | 0.8 | 0.45 |
| Ferritin | 3.4 | 2.0 | 1.7 | 0.10 |
| Kt/V | 2111.1 | 1630.1 | 1.3 | 0.20 |
| C-Reactive Protein | 447.2 | 549.3 | 0.8 | 0.42 |
| Dialysis Time | 1165.6 | 324.9 | 3.6 | 0.001 |

$R^2 = 0.25$ * : $P < 0.05$

# Summary ①

There were statistically significant findings in the six-hour HD patients with lower dosage of EPO.
(3111.8 versus 5375.0U/week).

There was not a statistically significant difference of Kt/V between the six-hour and the four-hour HD patients. (1.4 versus 1.5)

# Summary ②

The dialysis time was the only statistically significant factor in multiple regression analysis with EPO responsiveness.

# Discussion ①

Several studies have reported a positive relationship between EPO responsiveness and Kt/V. ※1~4

But these studies did not investigate the association between dialysis time and EPO requirement.


※1 Movilli et al : Nephrol Dial Transplant 16 : 111 – 114 , 2001

※2 Movilli et al : J Nephrol 16 : 546 – 551 , 2003

※3 Gawade et al : Clin J Am Soc Nephrol 5 : 576 – 581 , 2010

※4 Katzarki et al : Nephrol Dial Transplant 14 : 369 – 375 , 1999

# Discussion ②

We found that there are lower EPO requirements among six-hour HD patients without increasing Kt/V.

Thus, the dialysis time is a more important factor of EPO responsiveness than Kt/V.

# Discussion ③

We attribute the similar results in Kt/V between six-hour and four-hour HD patients to a significantly smaller membrane surface area in six-hour HD patients.

A six-hour HD facility aims for slow and long dialysis treatments, all the HD patients have undergone six-hour HD using a dialyzer with a small membrane surface area, and Kt/V is also not higher than the four-hour HD.

# Discussion ④

Several studies have reported that a higher dosage of EPO increases the risk of death and cardiovascular events in HD patients. ※1~3

Long-hours HD is known to have a good survival prognosis, which is one factor of why there may be the lower EPO dosage.


※1 Zhang et al : Kidney Int 80: 663-669, 2011

※2 Zhang et al : Am J Kidney Dis 44: 866-876, 2004

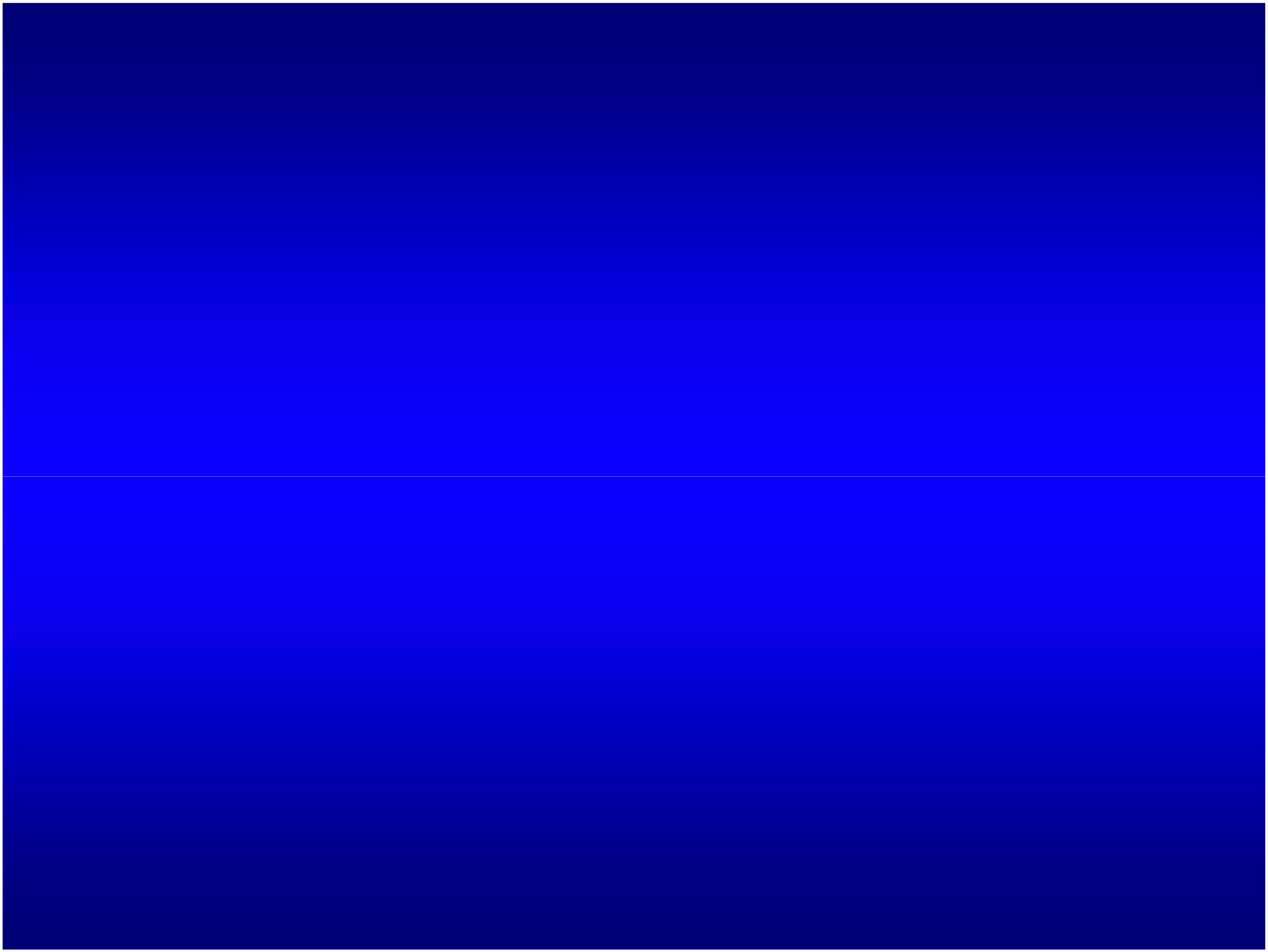
※3 Santos et al : Hemodial Int 15:493-500, 2011

# Limitation

This study is a cross-sectional analysis among subjects of HD patients with diabetes, which must be followed by a prospective randomized analysis among subjects comprising of all the HD patients.

# Conclusion

**The dialysis time is a more important factor of EPO response than Kt/V.**

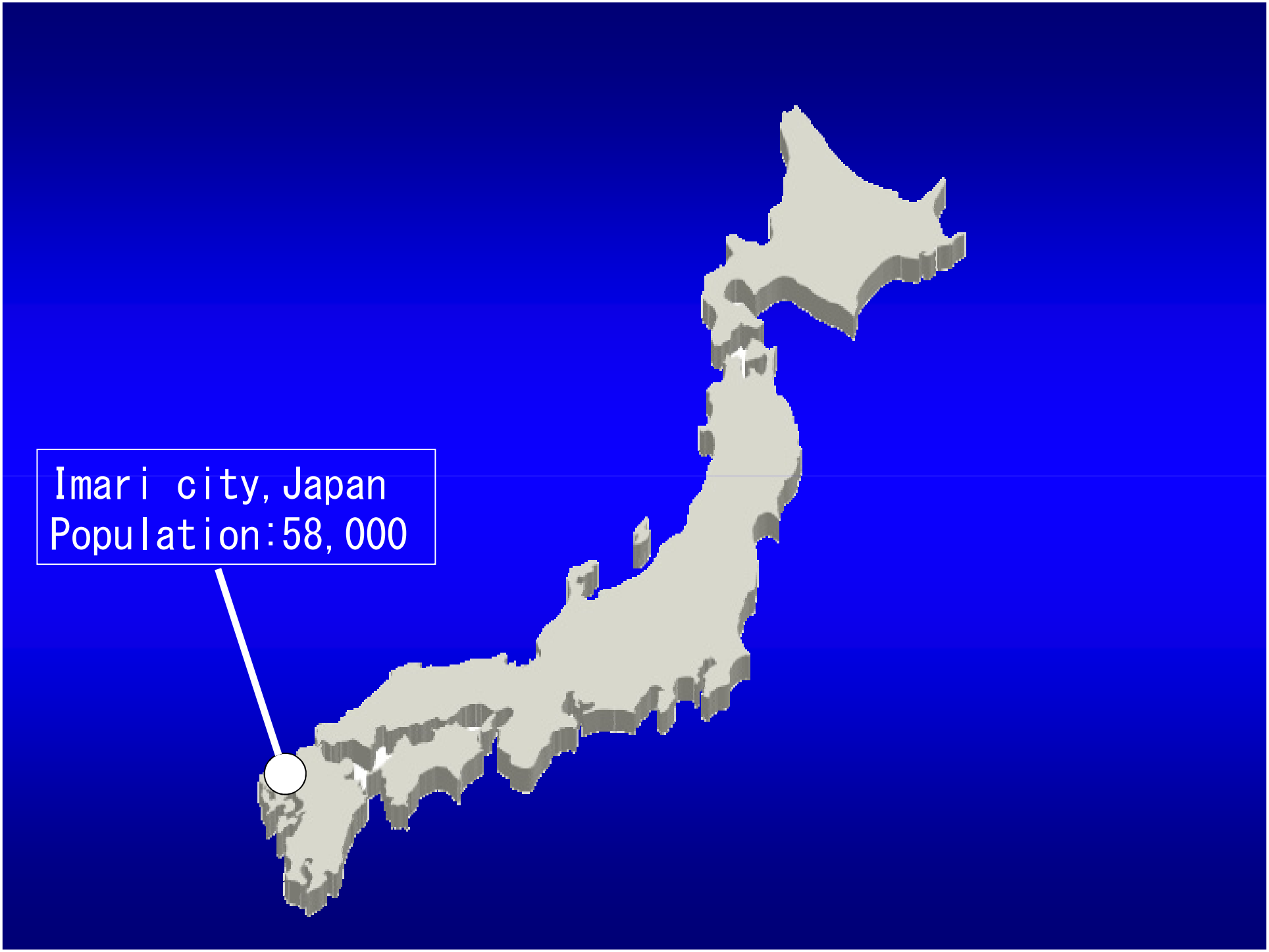


# Biography

| | |
|---|---|
| November 18, 1974 | Date of Birth |
| WORK EXPERIENCE | |
| April 2000 | Medical Practitioner National Board Examination Certification |
| May 2000 | Japanese Red Cross Fukuoka Hospital Intern for Internal Medicine |
| May 2001 | Kyushu University Hospital Intern for Internal Medicine |
| May 2002 | Japanese Red Cross Fukuoka Hospital Nephrologist |
| May 2003 | Steel Memorial Yawata Hospital Nephrologist |
| May 2004 | Saiseikai Yahata General Hospital Nephrologist |
| April 2007 | Aso Iizuka Hospital Nephrologist |
| April 2012 | Kouzenkai Maeda Hospital Nephrologist |

# Speciality

- Hemodialysis
- Continuous ambulatory peritoneal dialysis
- Renal transplantation
- Hypertension
- Diabetes mellitus
- Treatment of chronic kidney disease
- Treatment of acute kidney injury


Imari city,Japan
Population:58,000

# Specify of affiliation


| KOUZENKAI-MAEDA HOSPITAL CAPACITY AND AMENIMITIES | |
|---|---|
| Hospital Founded | Established in April 1916 |
| Inpatients | 129 Inpatient beds |
| Renal Failure Outpatients | 900 Patients per month |
| Diabetic Outpatients | 800 Patients per month |
| Hemodialysis Outpatients | 160 Patients |