



Post-transplant Renal Function and Cardiovascular Events Are Closely Associated With the Aortic Calcification Index in Renal Transplant Recipients

K. Imanishi, S. Hatakeyama, H. Yamamoto, A. Okamoto, A. Imai, T. Yoneyama, Y. Hashimoto, T. Koie, T. Fujita, R. Murakami, H. Saitoh, T. Funyu, S. Narumi, and C. Ohyama

ABSTRACT

Introduction. The aortic calcification index (ACI) is reported to be closely associated with renal dysfunction and cardiovascular events; however, its implication in renal transplant recipients has not been well examined. In this study, we investigated the relationship between pretransplant ACI, ACI progression, post-transplant renal function, and post-transplant cardiovascular events in renal transplant recipients.

Patients and methods. The study from June 1996 to Jan 2012 included 61 renal transplant recipients (living donors, 47; cadaveric donors, 14). The median follow-up period was 60 months. ACI was quantitatively measured on abdominal computed tomography. The relationship between age, dialysis period, estimated glomerular filtration rate (eGFR), and pre- and post-transplant ACI was longitudinally evaluated. Risk factors for post-transplant ACI progression were determined by logistic regression analysis. Patient background and the incidence of post-transplant cardiovascular events were also assessed.

Results. The pretransplant ACI (median 4.2%) significantly correlated with age at transplant, dialysis period, and diabetes mellitus. ACI gradually increased up to 2.8 times at 10 years after transplantation. Post-transplant eGFR significantly correlated with ACI progression in patients with chronic kidney disease of stage ≥ 3 . Logistic regression analyses showed that age at transplantation, post-transplant period, cadaveric donors, and post-transplant chronic kidney disease stage 3 were risk factors for post-transplant ACI progression. The pretransplant ACI was higher (median 66%) in 3 patients who experienced post-transplant cardiovascular events.

Conclusions. ACI progression closely correlates with age and post-transplant renal function. A high pretransplant ACI is a risk factor for post-transplant cardiovascular events in renal transplant recipients.

CARDIOVASCULAR DISEASE (CVD) remains the leading cause of death in patients with chronic kidney disease (CKD) including post-transplant patients [1,2].

Aortic calcification is a risk factor for CVD, and it is associated with coronary diseases, heart failure, and stroke [3,4]. Progression of aortic calcification is associated with age,

From the Departments of Urology (K.I., S.H., H.Y., A.O., A.I., T.Y., T.K., C.O.), Advanced Transplant and Regenerative Medicine (Y.H., C.O.), and Cardiology, Respiratory Medicine and Nephrology (T. Fujita, R.M.), Hirosaki University Graduate School of Medicine, Hirosaki, Japan; Department of Urology (H.S., T. Funyu), Oyokyo Kidney Research Institute, Hirosaki, Japan; and Department of Transplant Surgery (S.N.), Nagoya Daini Red Cross Hospital, Nagoya, Japan.

This work was supported by a Grant-in-Aid for Scientific Research 23791737 from Japan Society for the Promotion of Science.

Address reprint requests to Shingo Hatakeyama, MD, PhD, Department of Urology, Hirosaki University Graduate School of Medicine, 5 Zaifu-chou, Hirosaki 036-8562, Japan. E-mail: shingorilla2@gmail.com

0041-1345/14/\$—see front matter
<http://dx.doi.org/10.1016/j.transproceed.2013.09.039>

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360 Park Avenue South, New York, NY 10010-1710

Table 1. Patient Characteristics

Number of patients	61
Age at transplantation	44 ± 15
Dialysis periods (y)	4.6 ± 5.8
Gender (M/F)	39/22
Diabetes Mellitus	10 (16%)
Cadaveric donor kidney	23 (38%)
ABO incompatible	9 (15%)
Pre-transplant intact PTH (pg/mL)	181 ± 145
Past history of parathyroidectomy	4 (7%)
Post-transplant kidney (y)	5.0 ± 3.8
Renal allograft loss	6 (9.8%)
Past history of CVD	4 (6.6%)
Pre-operative ACI (%)	22 ± 28

hypertension, history of CVD and CKD including patients on dialysis [5,6]. Aortic calcification can be quantitatively measured on abdominal computed tomography (CT) as an aortic calcification index (ACI). The ACI is widely used [7–9] and expresses calcification in 12 sectors as a percentage. Several reports have documented the clinical significance of aortic calcification among dialysis patients [8,10]; however, its implication in renal transplant recipients has not been well examined. In this study, we investigated the relationship among pretransplant ACI, post-transplant ACI progression, post-transplant renal function, and post-transplant cardiovascular events in renal transplant recipients.

METHODS

Patients

This study was performed in accordance with the ethical standards of the Declaration of Helsinki and approved by the institutional ethics committee. The study conducted from June 1996 to January 2012 included 61 renal transplant recipients (living donors, 47; cadaver donors, 13) from the Hirosaki University Hospital and Oyokyo Kidney Research Institute, Hirosaki, Japan.

Abdominal CT and Evaluation of ACI

Patients were eligible for the study if a baseline abdominal CT had been performed within 12 months prior to transplantation. Follow-up CT was performed every 12 to 24 months after transplantation. ACI was quantitatively measured on abdominal CT (TSX-021B, Toshiba Medical systems Corp, Ohtawara, Japan) images above the bifurcation of the common iliac artery scanned 10 times at 10-mm intervals, as previously described [8].

Biochemical Assays

Blood and serum testing were routinely conducted every month after transplantation. The estimated glomerular filtration rate (eGFR) was calculated using the Modification of Diet in Renal Disease equation for Japanese patients [11].

Immunosuppression

Our standard immunosuppressive regimen consisted of induction with basiliximab, calcineurin inhibitor (CNI), mycophenolate mofetil (MMF), and methylprednisolone. In patients who had to undergo ABO-incompatible renal transplantation, low-dose rituximab

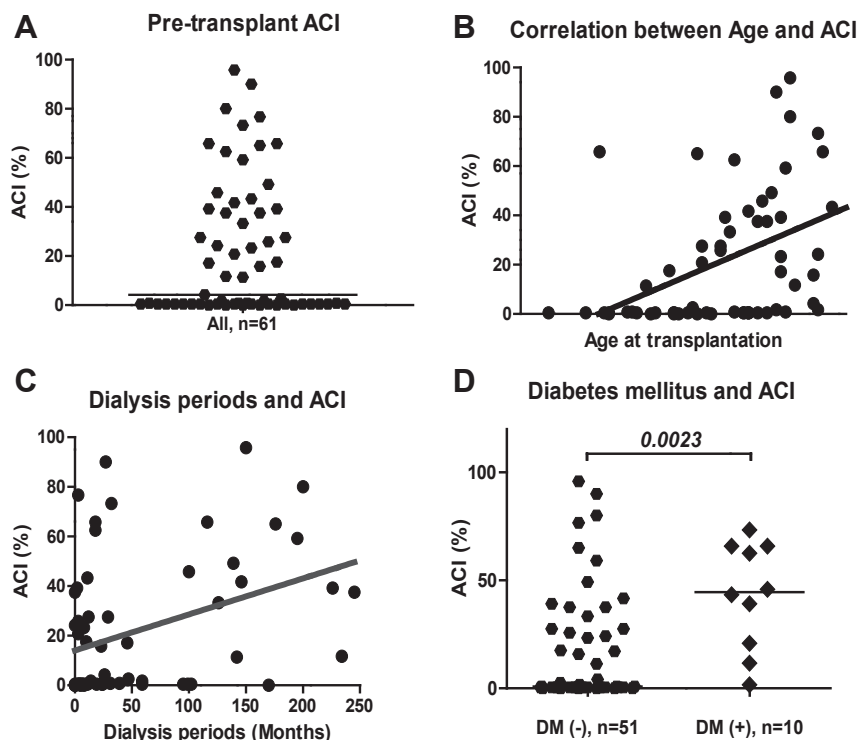


Fig 1. Association between pretransplant aortic calcification index (ACI) and clinical parameters. Median pretransplant ACI was 4.2% (A). Pretransplant ACI significantly correlated with age at transplant ($P < .001$) (B), dialysis period ($P = .015$) (C), and diabetes mellitus ($P = .0023$) (D).

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