

Long-term effects of contrast-enhanced intervention on progression of chronic kidney disease: A retrospective cohort study

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1. Introduction

In recent years, with increasing importance of accurate diagnosis and treatment, imaging interventions using a contrast medium have become inevitable. However, contrast media often cause hypersensitivity, and at times even to severe shock. Despite years of research, the pathogenesis of contrast-induced nephropathy (CIN) is not fully elucidated. Elderly people and those with chronic kidney disease (CKD) are especially at risk. CIN develops in 4–11% of patients with moderate renal dysfunction. Generally, the effects of CIN on renal function are transient. On the other hand, contrast media that impose burden on the kidneys may promote CKD progression in the long term as well as risk factors such as diabetes, centering on frequent imaging tests for chronic diseases and the like. Therefore, we evaluated the relationship between the intervention with use of contrast media and long-term displacement of renal function.

2. Methods

This was a longitudinal study (retrospective cohort) utilizing big data (*TheBD**: database of 7 million insured patients across Japan, April 2012–December 2020) gathered by the Japanese medical insurance system which included information on medical fee billing such as patient attributes, medical results. The subjects were patients with a definitive diagnosis of CKD (ICD10: N18). The cohort was divided into a contrast agent therapy (CAT) and non-contrast agent therapy (non-CAT) groups taking into account risk factors for CKD such as hypertension and diabetes; drugs including antihypertensive agents and analgesics; as well as age. The renal dysfunction was calculated from the correspondence table between the CKD stage (KDIGO2012: G1–G5) and the GFR reference value (CKD Clinical Guide, 2012). The renal dysfunction and numbers of contrast agent interventions were analyzed in taking into consideration the mutual occurrence timing.

3. Results

There were 226 patients in the CAT (age: 55.5 ± 8.9 , 67.7% males) and 1253 in the non-CAT group (age: 53.3 ± 10.4 , 66.1% males). Diabetic nephropathy was 4.0% in the CTA group and 3.5% in the non-CTA group ($p = 0.73$). The observation period was 5.8 ± 1.8 and 4.5 ± 2.3 years/case in the CAT and the non-CAT group, respectively. The number of contrast agent interventions was 2.1 ± 1.9 times/case. The final stage of the observation period was renal replacement therapy 10.6% (CAT: 14.6%, non-CAT group: 9.9%, $p = 0.04$), G3b 13.9% (CAT group: 17.7%, non-CAT group: 13.2%, $p = 0.07$) and others were 75.5% (CAT group: 67.7%, non-CAT group: 76.9%, $p = 0.01$). The results showed that the decrease in renal function was significantly greater in the CAT group with an average annual number ≥ 0.3 interventions than in the non-CAT group (GFR displacement: -2.36 ± 7.20 vs. -0.94 ± 3.04 mL/min/1.73 m²/year, $p = 0.05$, Fig1). In the population after stage G3b, with changes in renal function, a significant correlation was seen between the number of CATs and the amount of decrease in renal function ($p < 0.01$, Fig2).

Fig1. The decrease in renal function was significantly greater in the CAT group with an average annual number ≥ 0.3 interventions than in the non-CAT group.

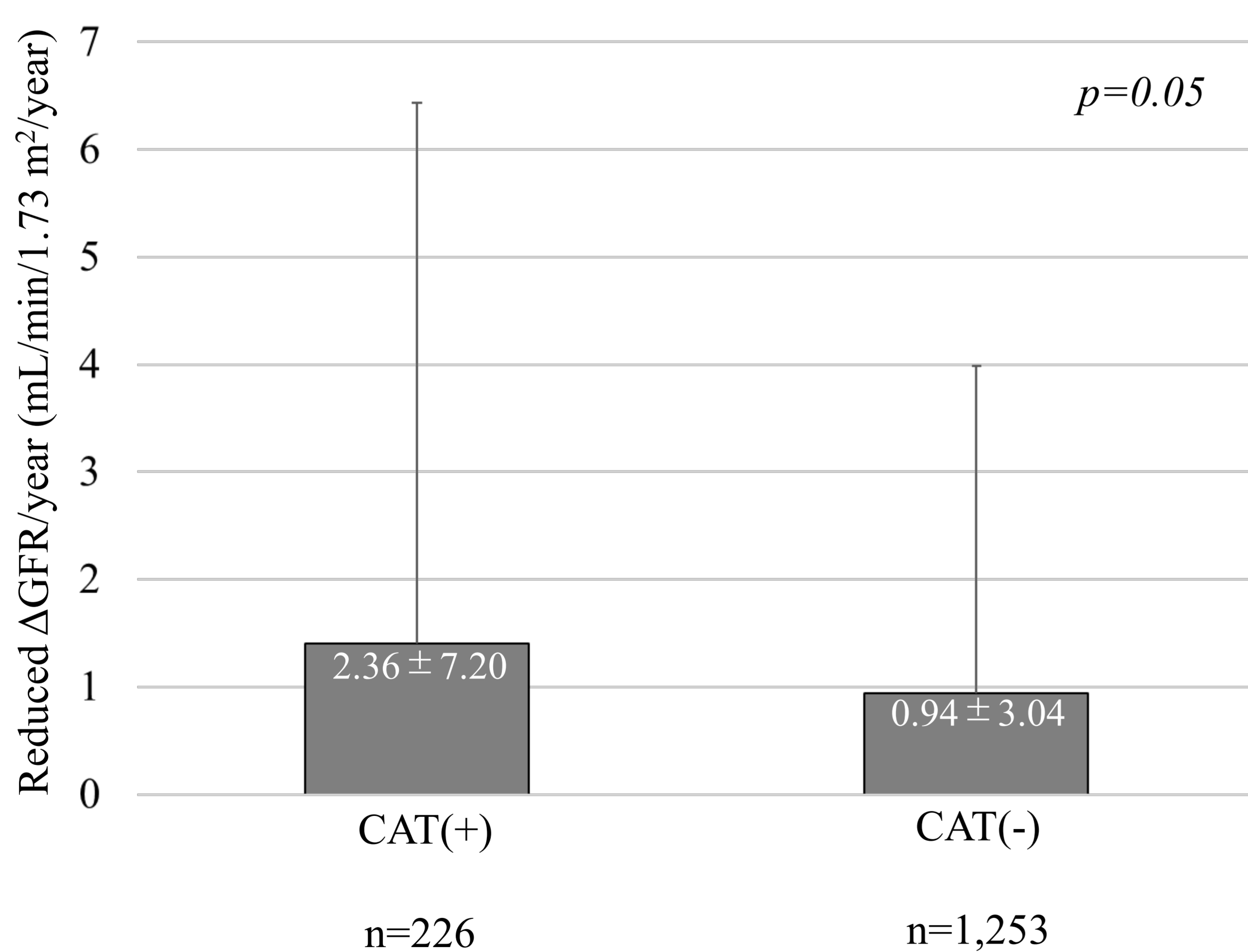
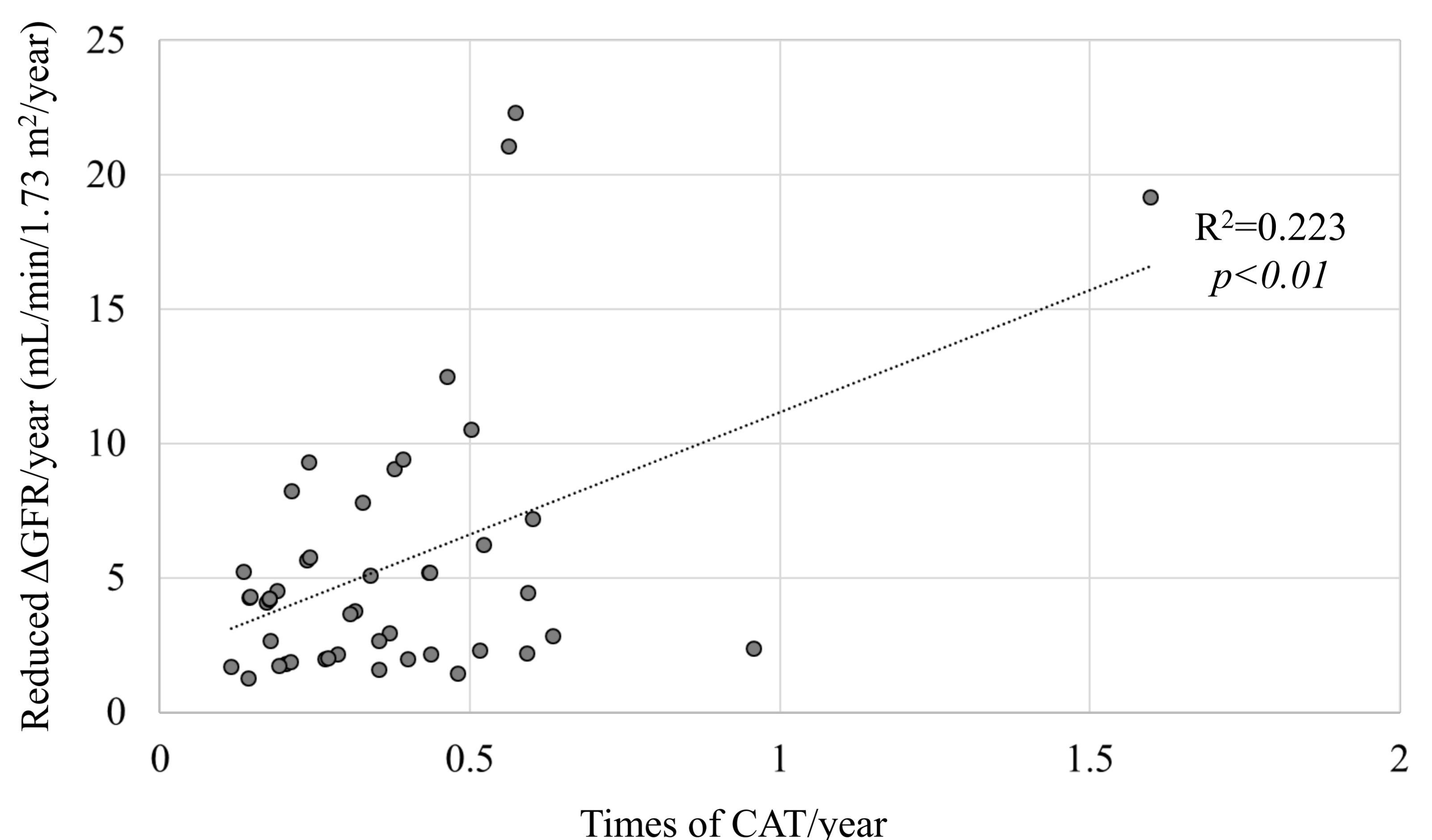


Fig2. In the population after stage G3b, with changes in renal function, a significant correlation was seen between the number of CATs and the amount of decrease in renal function.



4. Conclusions

Although careful interpretation is necessary, due to analytical constraints long-term longitudinal observations suggest that the number of contrast-enhanced interventions, similar to other risk factors, has a long-term effect on renal function. The data suggest that the strategy for selecting an appropriate contrast agent therapy for the moderate CKD stage can be an important countermeasure against CKDs.

【Other information】