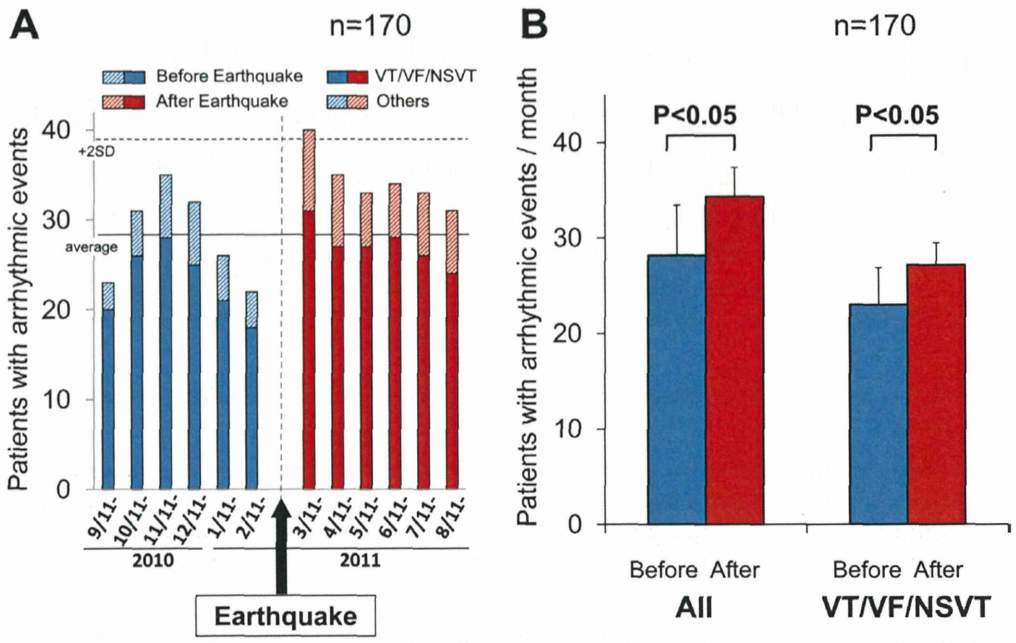

Figure 1. Tachyarrhythmias in patients with an ICD. (**A**) Time course of the number of patients with tachyarrhythmias before (blue bar) and after (red bar) the Earthquake. Horizontal lines show the monthly average (solid line) and +2SD (dotted) of the number of patients with any tachyarrhythmia for the 6-month period before the Earthquake. VT and VF, sustained ventricular tachycardia and fibrillation; NSVT, non-sustained VT. Others includes any tachyarrhythmic event except VT, VF and NSVT. (**B**) Number of patients with any tachyarrhythmia (**Left**) and ventricular arrhythmias (**Right**) detected by the device recording. ICD, implantable cardiac defibrillator.

increased after the Earthquake compared with before for any tachyarrhythmia (21±3 vs. 26±3, P<0.05) and for ventricular tachyarrhythmias (23±4 vs. 27±2, P<0.05) (**Figure 1B**). Most of the tachyarrhythmias recorded were ventricular arrhythmias, probably because undistinguishable tachyarrhythmias were recognized by the single-chamber device as ventricular in origin. In contrast, the incidence of appropriate and/or inappropriate defibrillator shocks, including anti-tachycardia pacing, was comparable before and after the Earthquake (appropriate shock: 9.2±2.5 vs. 9.0±1.4 patients/month). The storm of defibrillator shocks did not increase after the Earthquake.

In 74 CRT patients, we noted that 11 patients had 16 HF hospitalizations after the Earthquake, whereas 7 had 7 hospitalizations before the Earthquake. The incidence of HF hospitalization significantly increased after the Earthquake, followed by a gradual decrease to the pre-earthquake level (**Figure 2A**). The number of HF hospitalizations normalized by that of the patients on follow-up in the corresponding period significantly increased for the 6-month period after the Earthquake as compared with the preceding 6-month or 5-year average (both P<0.05) (**Figure 2B**). The hospitalized patients, as compared with the patients who were not hospitalized after the Earthquake, were characterized by several factors, including higher plasma B-type natriuretic peptide (BNP) levels (780±765 vs. 255±419 pg/ml; P<0.01), fewer CRT responders (45 vs. 80%; P<0.05) and a past history of more HF hospitalizations (1.9±2.0 vs. 0.27±0.75 HF hospitalizations for the previous 5 years, P=0.02). Data for intrathoracic impedance monitoring (OptiVol) were available only in 17 CRT patients, in whom the Optivol fluid index significantly increased after the Earthquake (cut-off ≥100 ohm; 2/17 vs. 8/17; P<0.05); however, no correlation was noted between the increase in the fluid index and clinical HF worsening. In this CRT population, 6 patients died during the 6 months after the Earthquake, including HF worsening in 4, cerebral hemorrhage in 1, and tsunami death in 1.

Discussion

This is the first study to demonstrate the clinical impact of the East Japan Earthquake on patients implanted with cardiac devices such as ICD and CRT. It has been reported that the incidence of CVD, such as hypertension, coronary artery disease, pulmonary embolism, ventricular arrhythmias and sudden cardiac death, increases after an earthquake.[1–3] Because almost all the study patients with ICD or CRT lived in the City of Sendai or the surrounding area, where the disaster affected ordinary life for more than 1 month, we were able to closely follow them even after the Earthquake. Importantly, in the present study, the recordings of the ICD/CRT device for most of the patients were available to examine the changes in cardiac rhythm abnormalities.

It has been previously reported that arrhythmic events deteriorate after an earthquake[2,3] or similar large-scale disaster.[6] In the present study, although defibrillator shocks were not increased, the device recordings clearly showed a significant increase in tachyarrhythmias after the Earthquake. Importantly, this phenomenon was sustained for a few months after the Earthquake, when the effect of aftershocks, deteriorated quality of life and physical/mental stress might have been involved.

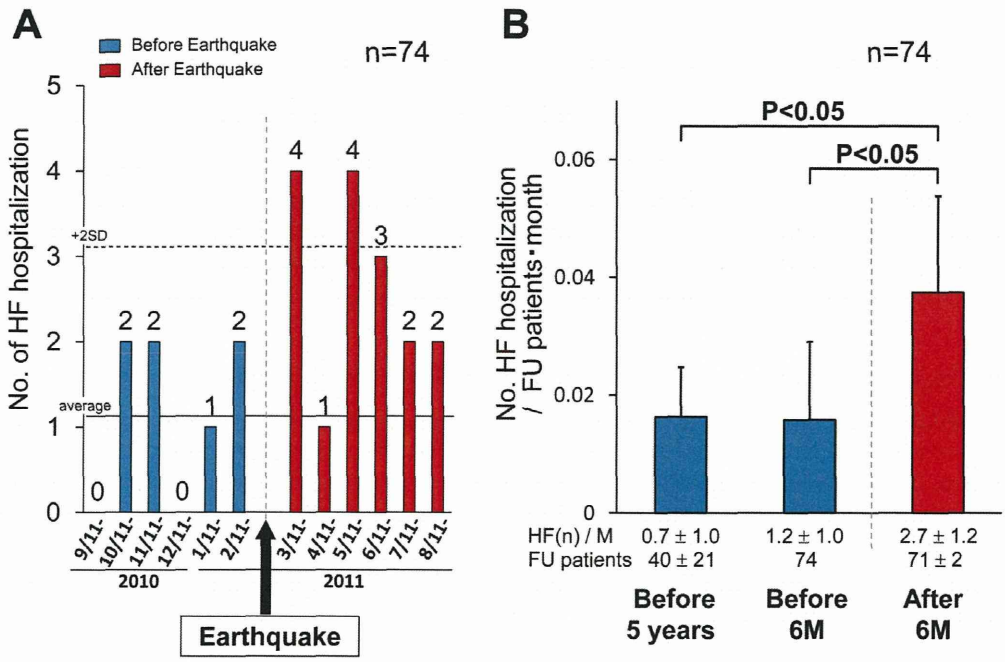

Figure 2. Heart failure (HF) hospitalization in patients with biventricular pacemakers (cardiac resynchronization therapy [CRT]). (**A**) Time course of the number of HF hospitalizations before (blue bar) and after (red bar) the Earthquake. Horizontal lines show the monthly average (solid line) and +2SD (dotted) of the number of patients with HF hospitalization for the 6-month period before the Earthquake. (**B**) Normalized monthly number of HF hospitalizations. The mean numbers of monthly HF hospitalization and follow-up patients are shown under the panel (mean±SD).

There has been no report on HF development and/or worsening after an earthquake. However, several causes related to a great earthquake could worsen clinical scenarios in patient with heart diseases, leading to the development and/or worsening of HF, including high-salt diet with preserved food and elevated blood pressure because of physical/mental stress, although drug withdrawal was less noted in the present study.

We observed an unfavorable effect of the Earthquake on HF worsening because we selected CRT patients who were prone to develop HF worsening. The present results suggest that CRT non-responders[4,5] and HF hospitalization repeaters are a high-risk population for cardiovascular events after an earthquake or other disaster.

Several limitations of the present study should be mentioned. First, it is retrospective and observational in design, which is inevitable for this type of study of a rare disaster. Second, the number of ICD or CRT patients examined was relatively small. Third, the diagnosis of tachyarrhythmias was based on the device report and depended on the device's settings.

In conclusion, we were able to demonstrate that the East Japan Earthquake disaster unfavorably affected patients with an ICD or CRT. We believe that the present results will contribute to the improvement of disaster medicine in the future.

Acknowledgement

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Disclosure

There is no financial support to disclose in this study.

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Supplemental Files

Supplemental File 1

Data S1. Methods

Table S1. Patients' Characteristics

Please find supplemental file(s);
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RAPID COMMUNICATION

Enhanced Rho-Kinase Activity in Patients With Vasospastic Angina After the Great East Japan Earthquake

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Background: It remains unclear whether disease activity of vasospastic angina (VSA) is altered during a disaster.

Methods and Results: Before and after the Great East Japan Earthquake, we examined Rho-kinase activity in circulating neutrophils of 11 VSA patients and their mental stress with the post-traumatic stress disorder (PTSD) questionnaire. Rho-kinase activity was significantly increased at 6 months after the Earthquake, and was returned to baseline level at 12 months. Importantly, percent change in Rho-kinase activity was significantly correlated with the PTSD score.

Conclusions: These results indicate that the Rho-kinase activity of VSA patients was transiently enhanced associated with disaster-related mental stress. (*Circ J* 2012; **76:** 2892–2894)

Key Words: Angina; Stress; Vasospasm

On March 11, 2011, we experienced the Great East Japan Earthquake in our Tohoku area. The Earthquake-related physical and psychological stress persisted for several months. Coronary vasomotor reactivity is known to be enhanced by stress[1] and we have previously demonstrated that Rho-kinase plays a key role in the molecular mechanisms of vasospastic angina (VSA).[2] We have also recently demonstrated that Rho-kinase activity in circulating neutrophils is a useful biomarker for the diagnosis and disease activity assessment of VSA.[3] We thus examined whether Rho-kinase activity was increased in VSA patients after the Earthquake.

Methods

The protocol of the present study was approved by the Ethical Committees of Tohoku University and all patients provided written informed consent. In 11 patients with VSA, all of whom had been previously diagnosed based on spasm provocation test with acetylcholine in accordance with the Guidelines for Diagnosis and Treatment of Patients with Vasospastic Angina of the Japanese Circulation Society,[4] we were able to measure Rho-kinase activity in circulating neutrophils at 3 time points: before and 6 and 12 months after the Earthquake. Rho-kinase activity was defined by the ratio of the phosphorylated form/total form of myosin-binding subunit, a substrate of Rho-kinase.[3] We also quantified the extent of mental stress at 6 and 12 months after the Earthquake with the post-traumatic stress disorder (PTSD) questionnaire that is widely used for screening of PTSD.[5] The PTSD questionnaire consists of 22 questions for major PTSD symptoms in order to categorize symptom severity into 5 different levels (0–4), where the cut-off value for PTSD is 25 points.[5] All results are expressed as mean±standard deviation (SD) and P values <0.05 were considered to be statistically significant.

Results

The mean age of the 11 patients (8 males, 3 females) was 62±11 years. The prevalence of hypertension, diabetes mellitus and dyslipidemia was 55%, 27% and 91%, respectively. Their left ventricular ejection fraction was well-preserved (71±9%) and 2 of them continued to smoke after the Earthquake. All patients continued their medical treatment with calcium-channel blockers (CCBs) and although there was no change in the levels of serological markers after the Earthquake, including high-sensitivity C reactive protein and lipid profiles (**Table**), Rho-kinase activity in circulating neutrophils was significantly increased at 6 months after the Earthquake and was returned

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Table. Changes in Serological Markers After the Great East Japan Earthquake

	Baseline (n=11)	6 months (n=11)	12 months (n=11)	P value
WBC (/μl)	4,900 (4,600, 6,100)	5,200 (4,600, 5,900)	4,500 (4,200, 7,100)	0.78
Hb (g/dl)	13.4±1.1	13.5±1.2	13.7±1.4	0.87
Ht (%)	39.2±3.2	39.5±3.5	39.4±4.1	0.98
hs-CRP (mg/dl)	0.084 (0.031/0.173)	0.046 (0.022/0.254)	0.052 (0.036/0.166)	0.86
LDL (mg/dl)	108±23	106±32	113±26	0.59
HDL (mg/dl)	46±13	50±16	48±10	0.45
TG (mg/dl)	169±81	171±92	123±54	0.23
Fasting serum glucose (mg/dl)	113±18	117±35	110±37	0.54
HbA_{1c} (%)	5.7±0.6	5.8±0.6	5.8±0.8	0.83

Values are mean±SD or median (25^{th} percentile/75^{th} percentile).
WBC, white blood cells; Hb, hemoglobin; Ht, hematocrit; hs-CRP, high-sensitivity C-reactive protein; LDL, low-density lipoprotein; HDL, high-density lipoprotein; TG, triglycerides.

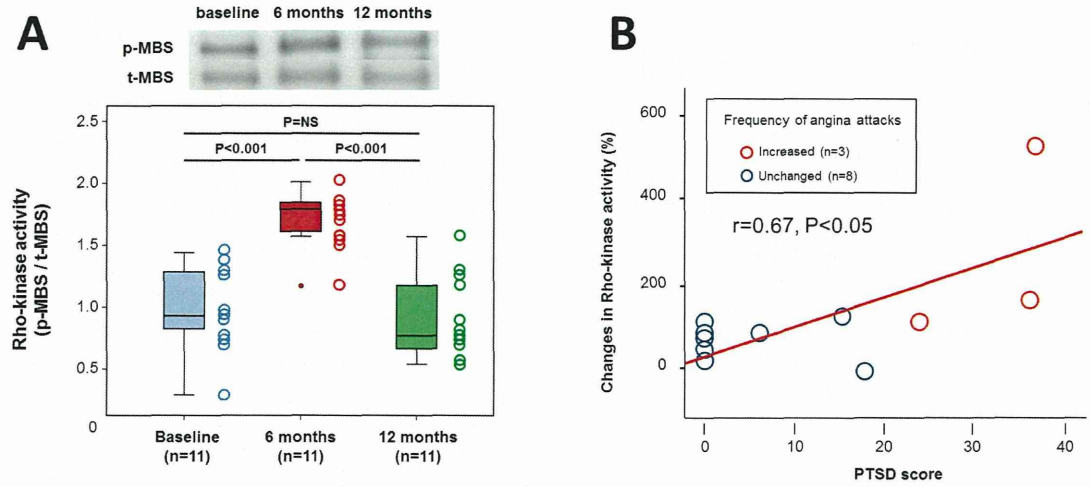

Figure. Changes in Rho-kinase activity in circulating neutrophils of patients with vasospastic angina (VSA). (**A**) Representative Western blotting of phosphorylated myosin-binding subunit (MBS) and total MBS in circulating neutrophils. Comparisons of Rho-kinase activity at 3 time points were performed with one-way ANOVA followed by Tukey's test. (**B**) Positive correlation between the PTSD score and the percent change in Rho-kinase activity from the baseline at 6 months after the Great East Japan Earthquake. Red circles represent VSA patients with increased symptoms after the Earthquake, and blue circles those with unchanged symptoms after the Earthquake, respectively. The relationship between the 2 values was examined with linear regression analysis. PTSD, post-traumatic stress disorder.

to the baseline level at 12 months (0.99±0.34 at baseline, 1.71±0.23 at 6 months, 0.90±0.34 at 12 months) (**Figure A**). Among the 11 patients, 3 were directly hit by the tsunami and complained of increased frequency of angina attacks after the Earthquake. In these 3 patients, as compared with the remaining 8 patients without direct tsunami-hit or worsening symptoms, both PTSD score (32±7 vs. 5±8, P=0.01) and the percent change in Rho-kinase activity from the baseline (268±232% vs. 55±40%, P<0.05) were significantly higher at 6 months after the Earthquake. Importantly, there was a significant positive correlation between the PTSD score and the percent change in Rho-kinase activity from the baseline at 6 months after the Earthquake (r=0.67, P<0.05) (**Figure B**). We also confirmed that elevated levels of PTSD score at 6 months after the Earthquake declined at 12 months, as in the case of Rho-kinase, although there was no significant correlation between the changes in the PTSD score and those in Rho-kinase activity from 6 to 12 months after the Earthquake (**Table S1**).

Discussion

The novel findings of the present study were that Rho-kinase activity in circulating neutrophils of VSA patients was changed dynamically in one year after the Earthquake and that the percent change in Rho-kinase activity from the baseline was positively correlated with the PTSD score in those patients. We have recently demonstrated that a ratio of 1.18 is the best cut-off level of Rho-kinase activity for the diagnosis of VSA and that medical treatment with CCBs ameliorated the level to below the cut-off value in VSA patients.[3] In the present study, although all the patients continued to take CCBs and no significant changes were noted for coronary risk factors or sys-

temic inflammation, Rho-kinase activity was significantly increased to 1.71 at 6 months after the Earthquake, a much higher level than the cut-off level of 1.18 for the diagnosis of VSA, and was returned to the baseline level at 12 months. Indeed, only 3 patients hit by the tsunami had exacerbated symptoms of VSA. However, since approximately two-thirds of the attacks of VSA patients were free of symptoms,[6] it is highly possible that the remaining 8 patients without worsening angina also had asymptomatic ischemic attacks when their Rho-kinase activity was increased after the Earthquake. VSA is known to be worsened by mental stress.[1] In the present disaster with a series of earthquakes and tsunami, mental stress was enhanced in many people in the Tohoku area. Thus, we quantified mental stress with the PTSD score that were established in the Hanshin-Awaji Earthquake in 1995 in Japan[5] and examined the relationship between the severity of PTSD and VSA disease activity. Importantly, we found a positive correlation between these 2 values at 6 months after the Earthquake. Particularly, the VSA patients who were directly hit by the tsunami and complained of increased angina attacks showed higher PTSD score and increased Rho-kinase activity. These findings indicate that coronary vasospastic activity, as reflected by the Rho-kinase activity, was significantly enhanced by the disaster-related mental stress. Coronary spasm plays an important role in the pathogenesis of ischemic heart disease and other systemic disorders.[7,8] Furthermore, it is conceivable that the transient enhanced coronary vasospastic activity may have increased cardiovascular events, such as sudden cardiac death, fatal arrhythmia and heart failure hospitalization, after the Earthquake, as we have recently reported.[9,10] Disaster stress could cause activation of the sympathetic nervous system and exacerbation of risk factors including hypertension, blood viscosity and platelet aggregating activity.[11] These disaster-related risk factors could also exacerbate VSA through Rho-kinase activation, although detailed mechanisms remain to be clarified in future studies.

The limitations of this study include the relatively small number of subjects and the lack of information on Rho-kinase activity in non-VSA subjects.

In conclusions, we were able to demonstrate the transient but significant increase in Rho-kinase activity in VSA patients after the Great East Japan Earthquake Disaster, in proportion to the extent of PTSD score, suggesting the importance of careful management of VSA patients after a disaster.

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Disclosures

Conflicts of Interest: None.

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Supplementary Files

Supplementary File 1

Table S1. Rho-Kinase Activity and PTSD Score at 6 and 12 Months After the Great East Japan Earthquake

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RAPID COMMUNICATION

Effect of the Great East Japan Earthquake on Cardiovascular Diseases

– Report From the 10 Hospitals in the Disaster Area –

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Background: We reported an increased occurrence of cardiovascular diseases (CVDs) after the Great East Japan Earthquake by examining ambulance records, but it had to be confirmed by cardiologists.

Methods and Results: We enrolled patients admitted to the cardiology department of the 10 hospitals in the disaster area from 4 weeks prior to 15 weeks after March 11 in the years 2008–2011 (n=14,078). The weekly occurrence of several CVDs, including heart failure (HF), pulmonary thromboembolism (PTE) and infectious endocarditis (IE), was sharply and significantly increased after the Earthquake.

Conclusions: The Disaster caused significantly increases in the occurrence of HF, PTE and IE. (*Circ J* 2013; **77:** 490–493)

Key Words: Cardiovascular disease; Disasters; Great East Japan Earthquake

We examined ambulance records from Miyagi prefecture and reported that the occurrence of cardiovascular diseases (CVDs), including heart failure (HF), acute coronary syndrome (ACS), stroke, and cardiopulmonary arrest, had increased after the Great East Japan Earthquake (magnitude 9.0 on March 11, 2011).[1] However, because the ambulance records were made in the emergency rooms by doctors who were not always cardiologists, our findings had to be confirmed by cardiologists in the disaster area. Furthermore, we did not examine the incidence of pulmonary thromboembolism (PTE), infectious endocarditis (IE) or takotsubo cardiomyopathy in that previous study because those diagnoses require a professional approach.[1]

In this study, we examined the medical records made by cardiologists to determine whether the occurrence of CVDs, including HF, acute myocardial infarction (AMI), PTE, IE and takotsubo cardiomyopathy, had increased after the Earthquake.

Methods

The ethical committees of Tohoku University Hospital and participating hospitals approved the protocol of the present study.

Study Population and Participating Hospitals

We enrolled all patients admitted to the cardiology department of the 10 hospitals in Miyagi prefecture from 4 weeks prior to 15 weeks after the Earthquake in 2011 and in the corresponding periods in 2008, 2009 and 2010 (n=14,078). We also col-

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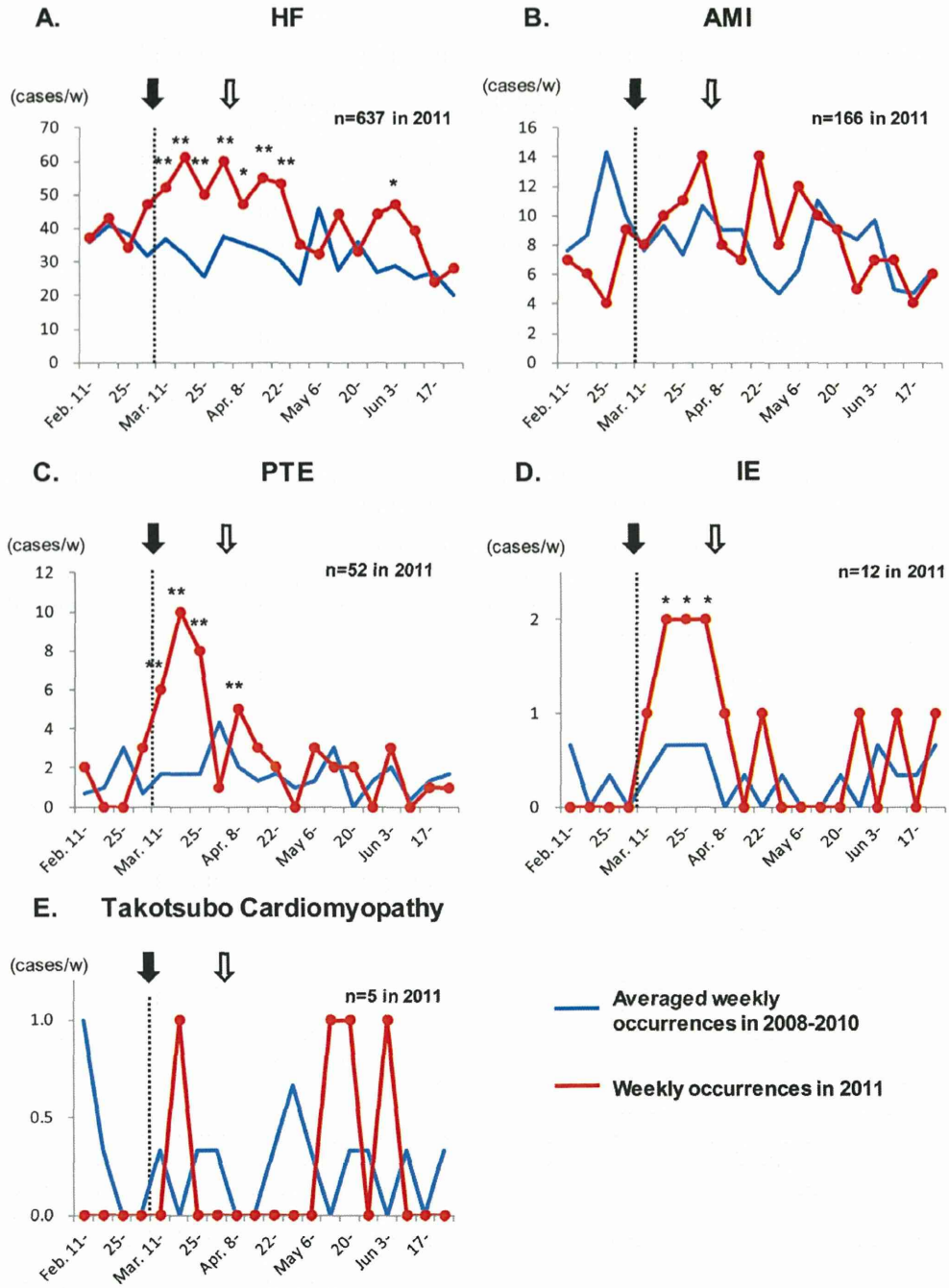

Figure 1. Weekly occurrence of cardiovascular diseases: (**A**) heart failure (HF), (**B**) acute myocardial infarction, (**C**) pulmonary thromboembolism (PTE), (**D**) infectious endocarditis (IE) and (**E**) takotsubo cardiomyopathy. HF, PTE and IE were significantly increased after the Earthquake. *P<0.05, **P<0.01. Black arrows indicate the occurrence of the Great East Japan Earthquake (magnitude 9.0, March 11, 2011), and white arrows indicate the largest aftershock (magnitude 7.2, April 7, 2011).

lected additional information about the date of admission, sex and age of the patients from the medical insurance database. We defined the 3 hospitals facing the Pacific Ocean as those in the seacoast area with direct assault by the tsunamis, and the remaining 7 hospitals as those in the inland (remote) area.

Definition of the Diseases

All definitive diagnoses of the patients were confirmed at discharge by cardiologists and classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10). We also collected the diag-

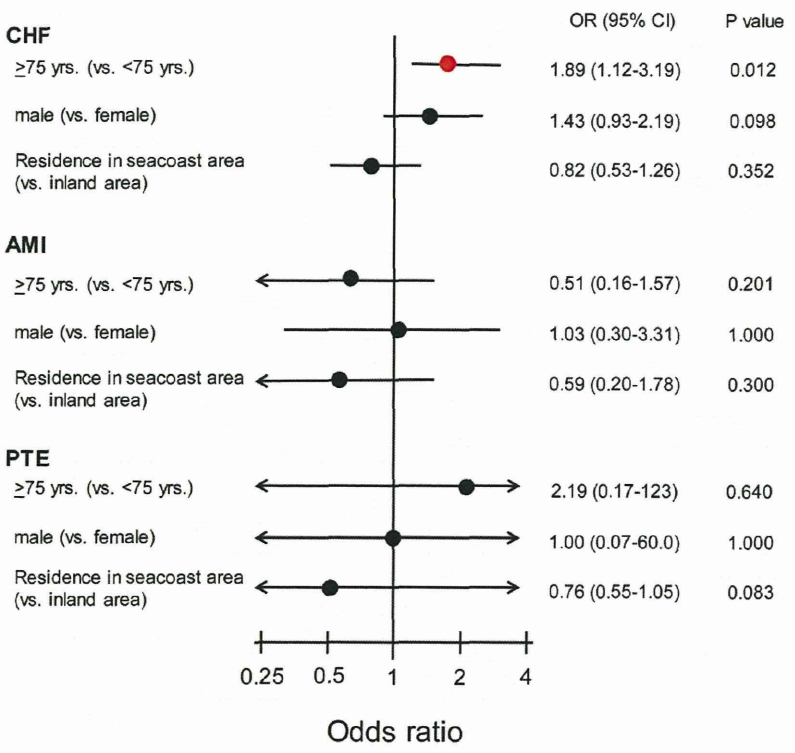

Figure 2. Effect of age, sex and area of residence on increased occurrence of cardiovascular diseases. We first counted the occurrence of each variable in the 4 weeks before and after the Earthquake in 2011, and subsequently calculated the odds ratio. No significant influence of age, sex or residence area was noted, except for the influence of high age on the occurrence of HF. Because there was no patient with IE or takotsubo cardiomyopathy before the Earthquake in 2011, we were unable to calculate the odds ratio of these 2 diseases. *P<0.05. AMI, acute myocardial infarction; HF, heart failure; PTE, pulmonary thromboembolism; OR, odds ratio; 95% CI, 95% confidence interval.

nosis at discharge from the medical insurance database as the ICD-10 code, comprising I-50.0 (HF), I-21.0–I-21.9 (AMI), I-26.0–I-26.9 (PTE), I-33.0–I-33.9 (IE) and takotsubo cardiomyopathy (I-51.8).

Statistical Analysis

We used a Poisson regression model to assess differences in the variables between 2011 and the previous 3 years.[1] Furthermore, as previously reported,[1] we calculated the odds ratio with the 4-week occurrence in 2011 before and after the Earthquake in terms of age (<75 or ≥75 years), sex, and area of residence (inland vs. seacoast). Continuous variables are expressed as mean±SD. All statistical analyses were performed using R 2.15.0 (www.r-project.org/). All P values were 2-sided, and P<0.05 was considered to be statistically significant.

Results

The number of patients enrolled in the study for 2008, 2009, 2010 and 2011 was 3,190, 3,582, 3,752 and 3,554, respectively. In 2011, the prevalence of male sex was significantly lower (62.2%, 61.75, 59.95 and 58.8% in 2008, 2009, 2010 and 2011, respectively, P=0.014) and age (years) was significantly higher (68.8±13.9, 69.5±13.9, 70.4±14.2, and 71.2±14.2 in 2008, 2009, 2010 and 2011, respectively, P<0.05).

The weekly occurrence of each of HF, PTE and IE was significantly increased after the Earthquake (**Figures 1A,C,D**). We also noted a mild but insignificant peak of the weekly occurrence of AMI after the Earthquake (**Figure 1B**). There were very few cases of takotsubo cardiomyopathy, even after the Earthquake (**Figure 1E**). The significant increase in the weekly occurrence of HF was prolonged for 7 weeks after the Earthquake in 2011 (**Figure 1A**), whereas the time course of PTE showed a second peak at the largest aftershock (magnitude 7.2 on April 7, 2011).

The subgroup analyses showed that among the 3 factors examined (age, sex, and area of residence), only higher age (>75 years) significantly influenced the occurrence of HF but not that of AMI or PTE (**Figure 2**). Because there was no patient with IE or takotsubo cardiomyopathy for 4 weeks before the Earthquake in 2011, we were unable to calculate the odds ratio of either disease.

Discussion

In the present study of cardiologists records, as compared with our recent study using ambulance records,[1] we were able to demonstrate the following: (1) a sharp and sustained (over 7 weeks) increase in the occurrence of HF after the Earthquake, (2) a sharp but transiently increased occurrence of both PTE and IE after the Earthquake, and (3) a tendency for the occurrence of AMI to be increased, but not that of takotsubo cardiomyopathy, after the Earthquake.

Increased Occurrences of CVD

The present study demonstrated a significant increase in the occurrence of both HF and PTE, consistent with the findings of our recent study[1] and another study,[2] and of IE, which was a novel finding not reported previously.[3–8]

The Earthquake forced many people in the Miyagi prefecture to take shelter and/or to live without daily necessities, services, and medicines. Disaster situations can increase the occurrence of CVDs through physical and mental stresses.[9] Furthermore, a prolonged stressful situation can suppress the immune sys-

tem,[10] leading to increased rates of infectious diseases, such as IE.

Activation of the sympathetic nervous system of people involved in the present disaster would have elevated both blood pressure and heart rate, as previously reported.[9,11] The report by Satoh et al has also demonstrated that self-monitored blood pressure significantly increased after the Earthquake.[12] Furthermore, we recently reported that the Earthquake increased the occurrence of ventricular tachyarrhythmias among patients with an implantable cardiac defibrillator.[13] Thus, we consider that an activated sympathetic nervous system, elevated blood pressure, and increased occurrence of tachyarrhythmias were all involved in the increased occurrence of HF during and after the Great East Japan Earthquake.

Although people in temporary accommodation were supplied with information and compression stockings, the increased occurrence of PTE after the Earthquake was not prevented.[3] The occurrence of severe PTE, with resultant improved mortality from PTE, may have been decreased; however, further studies regarding the effects of preventive practice for PTE are needed.

In the present study, the occurrence of AMI also tended to increase after the Earthquake, and in our recent study there was a significant increase in the occurrence of ACS (AMI plus unstable angina).[1] Unlike in a previous report,[3] we did not observe an increased occurrence of takotsubo cardiomyopathy. The reasons for the discrepancy remains to be examined in future studies.

Effects of Age, Sex and Location of Hospitals on CVDs

In the present study, no significant influence of age, sex or area of residence was noted for CVDs, except for the influence of higher age on the occurrence of HF, which suggested that the Earthquake had a greater effect on elderly people.

Although the tsunami directly and seriously affected the seacoast area, the increased occurrence of CVDs after the Earthquake was comparable between the seacoast and inland areas. Similar indirect effects of a disaster on CVD occurrence were reported after the World Trade Center Disaster in 2001, whereby the blood pressure of people in Mississippi was equally elevated as in those in New York City.[14] These results indicate that life-threatening events, such as a great earthquake, can trigger CVDs even in remote areas.

The limitations of this study include the lack of detailed patient data, such as clinical characteristics and underlying heart disease. In order to prospectively observe the long-term prognosis of the patients, we are following the HF patients in a cohort in the Tohoku area,[15] which had been established 2.5 years before the Earthquake.

Conclusions

The Great East Japan Earthquake Disaster significantly increased the occurrence of CVDs, including HF, PTE and IE. Elderly patients with HF were significantly more affected by the Earthquake.

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Disclosures

None.

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ORIGINAL ARTICLE
Critical Care

Emergency Care of Acute Myocardial Infarction and the Great East Japan Earthquake Disaster

– Report From the Miyagi AMI Registry Study –

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Background: Although emergency care of acute myocardial infarction (AMI) could theoretically be improved through improved patient delay, this notion remains to be confirmed. Additionally, the influence of large earthquakes on the emergency care of AMI cases remains to be elucidated. The Great East Japan Earthquake (March 11, 2011) has enabled us to address these issues.

Methods and Results: We analyzed the data from 2008 to 2011 (n=3,937) in the Miyagi AMI Registry Study. In-hospital mortality was significantly lower in 2011 as compared with the previous 3 years (7.3% vs. 10.5%, P<0.05). This improvement was noted especially during the first 2 months after the Earthquake, associated with shorter elapsing time from onset to admission (120 vs. 240 min, P<0.001) and higher performance rate of primary percutaneous coronary intervention (PCI) (86.8% vs. 76.2%, P<0.01). Importantly, after the Earthquake, patients with early admission (≤3 h from onset) was significantly increased (59.1% vs. 47.0%, P<0.05) and their prognosis became better (7.9% vs. 11.4%, P=0.02), associated with a lower prevalence of heart failure on admission (6.9% vs. 16.2%, P=0.02) and higher performance rate of primary PCI (89.1% vs. 76.4%, P<0.01).

Conclusions: Emergency care of AMI improved soon after the Great East Japan Earthquake compared with ordinary times by the contribution of earlier admission from onset and higher performance rate of primary PCI. (*Circ J* 2014; **78:** 634–643)

Key Words: Disaster management; Earthquakes; Emergency care; Myocardial infarction

Mortality from acute myocardial infarction (AMI) has decreased during the past decades associated with the widespread use of primary percutaneous coronary intervention (PCI).[1–3] In addition, it has been shown that a shorter elapsing time from onset of AMI to reperfusion (treatment delay) improves the clinical outcome of AMI patients.[4–6] Thus, it has been repeatedly pointed out that emergency care of AMI could theoretically be further improved through improved chain of survival, especially the patient delay.[4,7,8] However, this notion remains to be confirmed in a large community.[7,8] In addition, the influence of large earthquakes on the emergency care of AMI remains to be elucidated.

Editorial p586

On March 11, 2011, the Great East Japan Earthquake followed by a tsunami hit the northeastern coast region of Japan, one of the largest ocean-trench earthquakes ever recorded.[9–11] The Earthquake caused huge damage to Miyagi prefecture, the area closest to the epicenter, where 9,537 people have died, 1,297 are still missing and 266,871 houses were destroyed as of 10 October, 2013, 2.5 years after the Earthquake.[12] Many people have been severely inconvenienced and have suffered from physical and mental stress, increased salt intake from preserved foods and elevated blood pressure.[9,10,13] We recently

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