Clinical Differences of Recent Myocardial Infarction Compared With Acute Myocardial Infarction

— Insights From the Tokyo CCU Network Multicenter Registry —

Ryosuke Ito, MD; Jun Yamashita, MD; Taishiro Chikamori, MD; Seita Kondo, MD; Yuya Mitsuhashi, MD; Hiroshi Iwata, MD; Mike Saji, MD; Taku Asano, MD; Kohei Wakabayashi, MD; Kazuyuki Yahagi, MD; Toshiro Shinke, MD; Takaaki Mase, MD; Kaito Abe, MD; Hideki Miyachi, MD; Satoshi Higuchi, MD; Mikio Kishi, MD; Hiroyuki Tanaka, MD; Masao Yamasaki, MD; Katsumi Miyauchi, MD; Takeshi Yamamoto, MD; Ken Nagao, MD; Morimasa Takayama, MD

Background: Characteristics and treatment outcomes of acute myocardial infarction (AMI) patients have been studied; however, those of recent myocardial infarction (RMI) patients remain unclear. This study aimed to clarify characteristics, treatment strategy, and in-hospital outcomes of RMI patients in the Tokyo CCU network database.

Methods and Results: In total, 1,853 RMI and 12,494 AMI patients from the Tokyo CCU network database during 2013–2016 were compared. Both RMI and AMI were redefined by onset times of 2–28 days and ≤ 24 h, respectively. The RMI group had a higher average age (70.4 ± 12.9 vs. 68.0 ± 13.4 years, $P < 0.001$), more women (27.6% vs. 23.6%, $P < 0.001$), lower proportion of patients with chest pain as the chief complaint (75.2% vs. 83.6%, $P < 0.001$), higher prevalence of diabetes mellitus (35.9% vs. 31.0%, $P < 0.001$), and higher mechanical complication incidence (3.0% vs. 1.5%, $P < 0.001$) than did the AMI group. Thirty-day mortality was comparable (5.3% vs. 5.8%, $P = 0.360$); major causes of death were cardiogenic shock and mechanical complications in the AMI and RMI groups, respectively. Death from mechanical complications (not onset time) in the AMI group plateaued almost 1 week after hospitalization, whereas it continued to increase in the RMI group.

Conclusions: Both RMI and AMI patients have distinctive clinical features, sequelae, and causes of death. Although treatment of RMI patients adhered to guidelines, it was insufficient, and death from mechanical complications continues to increase.

Key Words: Acute myocardial infarction; Epidemiology; Mechanical complication; Recent myocardial infarction

Acute myocardial infarction (acute MI; AMI) is a major cause of morbidity and mortality, not only in Japan, but also worldwide. Patient characteristics and outcomes of AMI have been sufficiently investigated and treatment strategies have been established, such as the earlier primary percutaneous coronary intervention (PCI).^{1–5} In contrast, in asymptomatic patients, routine PCI of an occluded infarct-related artery 24 or 48 h or more after onset is not indicated, especially for ST-segment elevation MI (STEMI).^{3,6–8} However, the clinical features of these recent MI (RMI) 24 h or more after onset have not been fully evaluated. Furthermore, even in this modern age when the prognosis of AMI patients has improved, there

are a certain number of RMI patients whose prognosis has not improved. Accordingly, the purpose of the present study was to clarify characteristics, treatment strategy, and in-hospital outcomes of RMI patients in the Tokyo CCU network database within the contemporary real-world setting.

Methods

Study Design

This study was performed using data from the Tokyo CCU network database, collected between January 2013 and December 2016. Only the data of patients with MI were selected. Diagnoses of AMI were based on the univer-

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Mailing address: Jun Yamashita, MD, Department of Cardiology, Tokyo Medical University Hospital, 6-7-1 Nishi-shinjuku, Shinjuku-ku, Tokyo 160-0023, Japan. E-mail: jyamashi@xk9.so-net.ne.jp

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sal definition.⁹ The therapeutic strategies for AMI were decided by the cardiologists in each hospital, and all patients received treatment according to the Japanese Circulation Society, European Society of Cardiology, and American Council for Capital Formation/American Heart Association guidelines for the treatment of MI.²⁻⁴

The Tokyo CCU network database is an ongoing multicenter registry that prospectively collects information regarding emergency admissions to acute cardiac care facilities in Japan.¹⁰ The Tokyo CCU network was established in 1978 with the goal of treating patients with emergency cardiovascular events as promptly as possible, with the help of ambulance units dispatched through the Tokyo Fire Department. Deducing from the regional distribution of these 72 hospitals (as of 31 December 2016), the Tokyo CCU network probably includes 95% of all patients who have had an AMI within the Tokyo metropolitan area, serving a population of 13.5 million.⁵

For this study, 15,788 consecutive patients who satisfied the MI definition were identified. However, 1,246 patients (2 patients based on age, 9 on detailed diagnosis, 389 on Killip classification, 61 on ST-segment elevation, 228 on medical history, 139 on medical treatment, 42 on angiographic findings, 287 on invasive treatment, and 89 on clinical outcomes and early post-infarction complications) with incomplete data, were excluded from the analysis. We also excluded 66 patients with old MI of more than 28 days from onset and 129 patients strongly suspected of involvement of coronary spastic angina. Data from the remaining 14,347 patients were analyzed. Both RMI and AMI were redefined as follows: RMI patients whose onset-time was from 2 to 28 days and AMI patients whose onset-time was within 24 h. We compared 1,853 RMI patients and 12,494 AMI patients (Figure 1).

This study was conducted in accordance with the Declaration of Helsinki, in line with the Ethical Guidelines for Epidemiological Research by the Japanese government and approved by the Ethics Committee of the Tokyo CCU Network Scientific Committee (approval number 16-002).

According to the guidelines, the study satisfied the conditions for waiving the requirement for informed consent from individual participants, which was approved by the Ethics Committee of Tokyo CCU Network Scientific Committee. In accordance with rules set forth by the Ministry of Internal Affairs and Communications, patient data collection policies are displayed at each individual Tokyo CCU network institution, and patients can refuse to provide their own data.

Data Collection and Endpoint

Individual clinical information is recorded into the database by network members at each institution, and the final datasets are collected by the Tokyo CCU Network Scientific Committee under anonymity, according to the ethical guidelines on epidemiological surveys released from the Japanese Ministry of Health, Labor, and Welfare. Data collection and maintenance for the Tokyo CCU network registry were financially supported by the Tokyo Metropolitan Government, which had no role in the execution of this study or the interpretation of the results. From the hospital records of eligible patients, we extracted information on demographics, medical history, clinical data, clinical course, and the use of therapeutic interventions such as PCI, surgery, and medical circulatory support. The primary endpoint was all-causes of hospital mortality within 30 days, beginning from the first day of hospitalization. For this study, it is important to note the 30-day follow-up period after admission and that there were no data on prognosis collected after discharge.

Statistical Analysis

Continuous variables were presented as means±standard deviations or medians and interquartile range, and categorical variables as percentages. Categorical variables were tested using the Chi-squared test or, if not applicable, Fisher's exact test. Continuous variables were presented as means±standard deviations and were tested using the Student's t-test or the Mann-Whitney U-test. In the Chi-

Table 1. Baseline Clinical Characteristics

	Total	RMI	AMI	P value
n	14,347	1,853	12,494	
Age (years)	68.3±13.3	70.4±12.9	68.0±13.4	<0.001
Female	3,459 (24.1)	511 (27.6)	2,948 (23.6)	<0.001
BMI (kg/m²)	23.8±4.0	23.6±4.0	23.9±4.0	0.003
Coronary risk factor				
Hypertension	8,730 (60.8)	1,175 (63.4)	7,555 (60.5)	0.015
Dyslipidemia	6,041 (42.1)	769 (41.5)	5,272 (42.2)	0.571
Diabetes mellitus	4,538 (31.6)	665 (35.9)	3,873 (31.0)	<0.001
Smoking	7,642 (56.9)	970 (55.4)	6,672 (57.2)	0.172
Hyperuricemia	842 (5.9)	142 (7.7)	700 (5.6)	<0.001
Cardiovascular history				
MI	1,161 (8.1)	118 (6.4)	1,043 (8.3)	0.004
PCI	1,435 (10.0)	132 (7.1)	1,303 (10.4)	<0.001
CABG surgery	231 (1.6)	27 (1.5)	204 (1.6)	0.575
Heart failure	276 (1.9)	34 (1.8)	242 (1.9)	0.765
Cerebral infarction	923 (6.4)	122 (6.6)	801 (6.4)	0.777
Hemodialysis	398 (2.8)	54 (2.9)	344 (2.8)	0.694
Peripheral artery disease	225 (1.6)	42 (2.3)	183 (1.5)	0.010
Chief complaint				
Chest pain	11,841 (82.5)	1,394 (75.2)	10,447 (83.6)	<0.001
Dyspnea	1,470 (10.2)	312 (16.8)	1,158 (9.3)	<0.001
Killip classification				
Class I	10,235 (72.7)	1,277 (70.5)	8,958 (73.1)	
Class II	1,748 (12.4)	311 (17.2)	1,437 (11.7)	
Class III	749 (5.3)	119 (6.6)	630 (5.1)	
Class IV	1,337 (9.5)	105 (5.8)	1,232 (10.1)	
SBP (mmHg)	135 (116–156)	132 (114–150)	136 (116–157)	<0.001
HR (beats/min)	80.0±21.9	83.9±21.6	79.4±21.9	<0.001
Laboratory findings				
Maximum CPK value (IU/L)	1,470 (591–3,123)	627 (275–1,437)	1,629 (686–3,346)	<0.001
CRP (mg/dL)	0.25 (0.10–0.78)	1.21 (0.29–5.27)	0.20 (0.09–0.55)	<0.001
Hospitalization process				
Ambulance transportation services (including inter-hospital transfer)	10,629 (74.3)	1,008 (54.6)	9,621 (77.2)	
Self-hospitalization	2,773 (19.3)	701 (37.8)	2,072 (16.6)	
In-hospital onset	419 (2.9)	42 (2.3)	377 (3.0)	
ST-segment elevation	10,908 (76.0)	1,167 (63.0)	9,741 (78.0)	<0.001
Time course				
	(n=7,450)	(n=510)	(n=6,940)	
Door-to-Balloon time (min)	71.0 (48.0–109.0)	99.5 (58.0–281.0)	69.0 (48.0–105.0)	<0.001
	(n=10,482)	(n=661)	(n=9,821)	
Onset-to-Balloon time (h)	3.95 (2.33–9.50)	41.2 (22.9–81.2)	3.67 (2.25–7.83)	<0.001

Data are presented as n (%), mean±standard deviation (SD), or median (interquartile range; IQR), unless otherwise stated. AMI, acute myocardial infarction; BMI, body mass index; CABG, coronary artery bypass grafting; CPK, creatine phosphokinase; CRP, C-reactive protein; HR, heart rate; MI, myocardial infarction; PCI, percutaneous coronary intervention; RMI, recent myocardial infarction; SBP, systolic blood pressure.

squared analyses involving variables with more than 2 coding categories, adjusted standardized residuals were used to identify the contribution of different cells to the significance of the chi squares. Cumulative mortality during the first 30 days after admission was evaluated using Kaplan-Meier curves, and a log-rank test was used for comparisons between the groups.

For all analyses, 2-tailed probability values of <0.05 were considered significant. Statistical analysis was performed using IBM SPSS statistics 25 (IBM Corporation, Armonk, NY, USA).

Results

Baseline Clinical Characteristics

Baseline characteristics were different in several aspects between the RMI and AMI groups (**Table 1**). Elderly females with low body mass index (BMI) were significantly more common in the RMI than the AMI group. Although most patients with AMI complained of chest pain, the prevalence of dyspnea was higher in patients with RMI than in those with AMI. The RMI group had a significantly higher prevalence of hypertension, diabetes mellitus,

Table 2. Medication During Hospitalization

	Total	RMI	AMI	P value
Heparin	13,209 (92.5)	1,667 (90.5)	11,542 (92.8)	<0.001
Aspirin	13,604 (95.1)	1,729 (93.7)	11,875 (95.3)	0.003
Thienopyridine	12,239 (85.6)	1,480 (80.2)	10,759 (86.4)	<0.001
Statin	11,740 (82.5)	1,439 (78.3)	10,301 (83.1)	<0.001
β -blocker	9,746 (68.2)	1,242 (67.3)	8,504 (68.3)	0.400
ACEI / ARB	9,602 (67.2)	1,200 (65.0)	8,402 (67.5)	0.037

Data are presented as n (%). ACEI, angiotensin-converting-enzyme inhibitor; ARB, angiotensin II receptor blocker. Other abbreviations as in Table 1.

Table 3. Angiographic Findings and Invasive Procedures

	Total	RMI	AMI	P value
Emergency CAG	13,748 (95.8)	1,655 (89.3)	12,093 (96.8)	<0.001
Location of culprit lesion				<0.001
RCA	4,935 (36.2)	512 (31.1)	4,423 (36.8)	
LMT	341 (2.5)	28 (1.7)	313 (2.6)	
LAD	6,373 (46.7)	855 (52.0)	5,518 (46.0)	
LCX	1,923 (14.1)	242 (14.7)	1,681 (14.0)	
Others	78 (0.6)	8 (0.5)	70 (0.6)	
Multi-vessel coronary disease	6,349 (45.9)	924 (54.7)	5,425 (44.6)	<0.001
Initial TIMI flow				<0.001
Grade 0	7,537 (56.7)	758 (47.0)	6,779 (58.0)	
Grade 1	1,679 (12.6)	236 (14.6)	1,443 (12.4)	
Grade 2	2,090 (15.7)	312 (19.3)	1,778 (15.2)	
Grade 3	1,981 (14.9)	308 (19.1)	1,673 (14.3)	
Treatment				
PCI	12,852 (89.6)	1,463 (79.0)	11,389 (91.2)	<0.001
TIMI grade 3 flow post PCI	11,772 (93.9)	1,330 (93.2)	10,442 (93.9)	0.271
	(n=7,450)	(n=510)	(n=6,940)	
Door-to-balloon times under 90 min	4,959 (66.6)	234 (45.9)	4,725 (68.1)	<0.001
Door-to-balloon times under 24 h	7,177 (96.3)	420 (82.4)	6,757 (97.4)	<0.001
CABG	521 (3.7)	110 (6.0)	411 (3.3)	<0.001
IABP	2,294 (16.0)	221 (11.9)	2,073 (16.6)	<0.001
ECMO	450 (3.1)	27 (1.5)	423 (3.4)	<0.001

Data are presented as n (%). CAG, coronary angiography; ECMO, extra-corporeal membrane oxygenation; IABP, intra-aortic balloon pumping; LAD, left anterior descending artery; LCX, left circumflex artery; LMT, left main coronary trunk; RCA, right coronary artery; TIMI, Thrombolysis in Myocardial Infarction. Other abbreviations as in Table 1.

and peripheral artery disease. The RMI group had more Killip class II and III patients and more patients who had self-hospitalized, and only half of the RMI group had availed ambulance transportation services (including inter-hospital transfer). ST-segment elevation was more common in the AMI group. The RMI profile tended to involve high C-reactive protein (CRP) on admission and lower maximum creatine phosphokinase (CPK). There were no significant differences in the prevalence of dyslipidemia and smoking history between the 2 groups. Onset-to-balloon time and door-to-balloon time tended to be shorter in the AMI group than in the RMI group. However, there was a substantial amount of missing data in the time course; in particular, the differences between door-to-balloon time and onset-to-balloon time were because of missing door-time data in several cases. The percentage of missing data was 18.1%, 41.5%, and 1.6% for onset-time, door-time, and balloon-time, respectively. With the exception of time course, the mean percentage of missing data among vari-

ables in **Table 1** was 1.1% for both groups; the highest proportion of missing data was for smoking history (5.6% and 6.6%), followed by BMI (4.9% and 6.7%) and value of max CPK (5.8% and 3.2%), respectively.

Medication During Hospitalization

Medication during hospitalization such as antiplatelet and statin were used more frequently in AMI than RMI patients, with the exception of β -blocker, which was not significantly different (**Table 2**). The mean percentage of missing data among variables in **Table 2** was 0.5% in the RMI and 0.4% in the AMI group; the highest proportion of missing data was for statin (both 0.8%).

Angiographic Findings and Invasive Procedures

The RMI group had more left anterior descending artery (LAD) lesions and multi-vessel coronary disease than the AMI group. Initial Thrombolysis in MI (TIMI) flow grade 0 was less prevalent in the RMI group than in the AMI

Table 4. Early Post-Infarction Complications				
	Total	RMI	AMI	P value
Mechanical complications	246 (1.7)	56 (3.0)	191 (1.5)	<0.001
Cardiac rupture	136 (0.9)	24 (1.3)	112 (0.9)	0.098
Ventricular septal rupture	70 (0.5)	27 (1.5)	43 (0.3)	<0.001
Papillary muscle rupture	20 (0.1)	2 (0.1)	18 (0.1)	0.512
Arrhythmia event				
VT/VF	643 (4.5)	48 (2.6)	595 (4.8)	<0.001

Data are presented as n (%). VF, ventricular fibrillation; VT, ventricular tachycardia. Other abbreviations as in Table 1.

Table 5. Clinical Outcomes				
	Total	RMI	AMI	P value
30-day mortality	825 (5.8)	98 (5.3)	727 (5.8)	0.360
Cause of death	(n=825)	(n=98)	(n=727)	0.024
Cardiogenic shock	248 (30.1)	18 (18.4)	230 (31.6)	
Mechanical complications	111 (13.5)	22 (22.4)	89 (12.2)	
Multiple organ failure	104 (12.6)	10 (10.2)	94 (12.9)	
Cardiac failure	75 (9.1)	10 (10.2)	65 (8.9)	
Fatal arrhythmia	82 (9.9)	11 (11.2)	71 (9.8)	
Others	205 (24.8)	27 (27.6)	178 (24.5)	

Data are presented as n (%). Abbreviations as in Table 1.

Table 6. Stratified Analysis for STEMI and NSTEMI				
	Total	RMI	AMI	P value
STEMI group				
n	10,908	1,167	9,741	
Mechanical complications	216 (2.0)	42 (3.6)	174 (1.8)	<0.001
30-day mortality	602 (5.5)	65 (5.6)	537 (5.5)	0.936
NSTEMI group				
n	3,439	686	2,753	
Mechanical complications	31 (0.9)	14 (2.0)	17 (0.6)	<0.001
30-day mortality	223 (6.5)	33 (4.8)	190 (6.9)	0.047

Data are presented as n (%). NSTEMI, non-ST-segment elevation myocardial infarction; STEMI, ST-segment elevation myocardial infarction. Other abbreviations as in Table 1.

group. Compared with the AMI group, fewer patients underwent emergency coronary angiography (CAG), and PCI treatment was reduced, but more patients underwent coronary artery bypass grafting (CABG) in the RMI group. The frequency of using the circulatory assist device was higher in the AMI group (Table 3). The attainment rate of final TIMI flow grade 3 was similar in the 2 groups, whereas the prevalence of PCI within 90 min or 24 h of door-to-balloon times was less in the RMI group. The mean percentage of missing data among variables in Table 3 was 4.8% in the RMI and 1.7% in the AMI group; the highest proportion of missing data was for initial TIMI flow grade (12.9% and 6.6%), followed by infarct-related artery (11.2% and 3.9%), and multi-vessel coronary disease (8.9% and 2.7%), respectively.

Early Post-Infarction Complications

The incidence of mechanical complications was increased in the RMI group (3.0% vs. 1.5%, $P<0.001$). Detailed examination of mechanical complications revealed a similar prevalence of cardiac rupture in the 2 groups, and an

increased prevalence of ventricular septal rupture for the RMI group (1.5% vs. 0.3%, $P<0.001$). The occurrence of ventricular tachycardia and fibrillation were more frequent in the AMI group as arrhythmic complications (Table 4). There were no missing data among the variables in Table 4.

Clinical Outcomes

During the 30-day follow-up period, all-causes of death occurred in 98 patients in the RMI and in 727 patients in the AMI group. In-hospital 30-day mortality was equivalent between the 2 groups (5.3% vs. 5.8%, $P=0.360$); the major cause of death in the AMI group was cardiogenic shock, whereas in the RMI group, it was mechanical complications (Table 5). There were no missing data among the variables in Table 5. Stratified sub-analyses of STEMI and non-STEMI (NSTEMI) were conducted for the incidence of mechanical complications and 30-day mortality (Table 6). In the stratified analyses of STEMI and NSTEMI, the incidence of mechanical complications was increased in the RMI group, as in the overall analysis. There was no difference in the 30-day mortality rate

Figure 2. Kaplan-Meier curves for 30-day incidence of clinical outcome in patients with myocardial infarction stratified according to onset time. **(A)** All-cause mortality; **(B)** cumulative incidence of death due to cardiogenic shock; **(C)** cumulative incidence of death due to mechanical complication. RMI, recent myocardial infarction; AMI, acute myocardial infarction.

between the 2 groups in the STEMI analysis, whereas in the RMI group, a lower 30-day mortality rate compared with the AMI group was found in the NSTEMI analysis. On Kaplan-Meier analysis, the 2 groups did not differ in all-causes of death, although there were significantly different cumulative incidences of death due to cardiogenic shock ($P=0.006$, Log-rank test) and mechanical complica-

tions ($P=0.021$, Log-rank test). Furthermore, death due to mechanical complications (not onset time) in the AMI group plateaued after about 1 week from hospitalization, whereas in the RMI group, it continued to increase (**Figure 2A–C**). As mentioned above, it is important to note the 30-day follow-up period after admission, and that there were no data on long-term prognosis in this study.

Discussion

To the best of our knowledge, this is the first retrospective multicenter observational study to demonstrate the clinical differences between RMI and AMI in contemporary Japanese clinical practice. One of the relevant findings of the present study was that the RMI group tended to include more elderly females with a history of hypertension and diabetes mellitus. In general, ACS with atypical symptoms or no symptoms is often seen in elderly, diabetic, and female patients.^{11–14} As such, the diagnosis of AMI may be delayed or missed.¹⁵ In addition, the elderly have more comorbidities and are less likely to receive reperfusion therapy than younger patients.^{16,17} Females also tend to present more often with atypical symptoms; up to 30% in some registries.^{15,18,19} Even if the elderly female patients do not experience typical chest pain, it is necessary to instruct them to visit a hospital as soon as possible with any symptoms, particularly with dyspnea.

The second contribution of the present study was, despite finding that there was no difference in the in-hospital mortality rate of RMI patients compared with AMI patients, that the major cause of death was different; RMI patients had more mechanical complications. Furthermore, death due to mechanical complications continued to increase in RMI patients even while continuing hospitalization treatment. A long time from onset to hospitalization (especially ≥ 24 h) is a risk for occurrence of mechanical complications.^{20,21} In a previous study investigating 5,230 MIs, 77 mechanical complications (1.5%) were observed, and performing reperfusion therapy and time from symptom onset to hospitalization ≥ 6 h were independent predictors of mechanical complications.²⁰ The incidence of mechanical complications in the present study was similar to previous reports, and was higher in the RMI group, which was also the same in the stratified analyses of STEMI and NSTEMI. Another study also reported that timely reperfusion therapy and administration of β -blocker, angiotensin-converting enzyme inhibitor (ACEI), and aspirin are effective in reducing the incidence of mechanical complications.²² The study found that aspirin, statins, and cardioprotective drugs such as ACEI and β -blocker were not sufficiently introduced, especially in patients with RMI, and optimal medical therapy for RMI patients might leave the door open to reduced mechanical complications.

As described above, RMI and AMI have different patient populations. RMI patients are considered to be a group of patients who have survived through the hyperacute phase of AMI, which has the highest mortality. The exact mortality rate of RMI patients is unknown because it is not possible to analyze patients who could not reach the hospital or those who did not visit the hospital without complications, but at least in-hospital mortality was equivalent to AMI. In RMI patients, deaths due to mechanical complications continued to increase even as hospitalization continued. In the stratified analyses of STEMI and NSTEMI, the incidence of mechanical complications was increased in the RMI group, as was the case in the overall analysis. However, there might have been more low-risk patients in the RMI group because of the lower mortality rate associated with NSTEMI than with STEMI. In other words, RMI patients might have had STEMI or NSTEMI; those with STEMI had advanced infarction and severe myocardial damage but survived until reaching the hospi-

tal, and those with NSTEMI had troponin positivity but no major myocardial damage. As the RMI severity may vary among patients, treatment strategies for RMI may need to be established separately from those for AMI. Further research to determine the optimal treatment strategy for RMI patients needs to be conducted.

Study Limitations

There are several limitations. First, the study was a retrospective observational study, and it is possible that unappreciated or unmeasurable confounding variables altered the results. Second, the present study was limited to a specific geographic area; therefore, there may have been some selection bias for enrollment, which may make it difficult to apply the present study results to all MI patients in Japan. Third, the date of death due to mechanical complications was different from the date of onset because the timing of mechanical onset was not tabulated. In the RMI group, deaths due to mechanical complications continued to increase during hospitalization, but the timing of their onset was unknown. Further research is needed to determine the frequency of occurrence of mechanical complications. Fourth, the cause of death was determined by the cardiologists in each hospital from clinical diagnosis or autopsy diagnosis. However, no detailed data were collected on the method used in determining the causes of death. Finally, this study was not a comparison of disease from onset but a comparison over a very limited time period from the admission. We conducted a comparative study of the same disease using different time periods, especially for the RMI group, because it was not possible to collect data until admission. Furthermore, as there were no data on prognosis after hospital discharge, the natural history of RMI was unknown. Additional detailed nationwide observational studies with long-term follow up are needed for further evaluation.

Conclusions

The RMI patients had distinctive clinical features and sequelae compared with AMI patients, and the major cause of death of RMI patients was different from that of AMI patients. Furthermore, in RMI patients, deaths due to mechanical complications continued to increase even as hospitalization continued. Further investigation is needed to clarify the treatment strategy for RMI patients.

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Data Availability

In principle, the availability of the data used in this study is not shared.

Disclosures

Data collection and maintenance for the Tokyo CCU network registry is financially supported by the Tokyo Metropolitan Government, which had no role in the execution of this study or in the interpretation of the results.

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