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Original article

Clinical outcomes of percutaneous coronary intervention for acute coronary syndrome between hospitals with and without onsite cardiac surgery backup

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ABSTRACT

Background: Based on the 2011 American College of Cardiology/American Heart Association percutaneous coronary intervention (PCI) guideline, it is recommended that PCI should be performed at hospital with onsite cardiac surgery. But, data suggest that there is no significant difference in clinical outcomes following primary or elective PCI between the two groups. We examined the impact of with or without onsite cardiac surgery on clinical outcomes following PCI for acute coronary syndrome (ACS). **Methods and results:** From August 2008 to March 2011, subjects ($n = 3241$) were enrolled from the Kumamoto Intervention Conference Study (KICS). Patients were assigned to two groups treated in hospitals with ($n = 2764$) or without ($n = 477$) onsite cardiac surgery. Clinical events were followed up for 12 months. Primary endpoint was in-hospital death, cardiovascular death, myocardial infarction, and stroke. And we monitored in-hospital events, non-cardiovascular deaths, bleeding complications, revascularizations, and emergent coronary artery bypass grafting (CABG). There was no overall significant difference in primary endpoint between hospitals with and without onsite cardiac surgery [ACS, 7.6% vs. 8.0%, $p = 0.737$; ST-segment elevation myocardial infarction (STEMI), 10.4% vs. 7.5%,

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$p = 0.200$). There was also no significant difference when events in primary endpoint were considered separately. In other events, revascularization was more frequently seen in hospitals with onsite surgery (ACS, 20.0% vs. 13.0%, $p < 0.001$; STEMI, 21.9% vs. 14.5%, $p = 0.009$). We performed propensity score matching analysis to correct for the disparate patient numbers between the two groups, and there was also no significant difference for primary endpoint (ACS, 8.6% vs. 7.5%, $p = 0.547$; STEMI, 11.2% vs. 7.5%, $p = 0.210$).

Conclusions: There is no significant difference in clinical outcomes following PCI for ACS between hospitals with and without onsite cardiac surgery backup in Japan.

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Introduction

Since coronary balloon angioplasty was introduced into clinical practice in 1977, marked advances in technology, technique, device, type of stent (bare metal stent, drug-eluting stent [1,2]), adjunctive pharmacotherapy, and operator experience have resulted in higher rates of procedural success and lower rates of complications [3,4].

Based on 2011 American College of Cardiology Foundation/American Heart Association/Society for Cardiovascular Angiography and Interventions (ACCF/AHA/SCAI) percutaneous coronary intervention (PCI) guidelines, it is recommended that elective/urgent PCI should be performed by operators with an acceptable annual volume (over 75 PCI procedures per year) at high volume centers (over 400 PCI procedures per year) with onsite cardiac surgery (class I = The benefits and efficacy of a method of evaluation or treatment has been demonstrated or are widely approved) [5]. But, data in the literature suggest that there is no significant difference in clinical outcomes following primary [6] or elective [7,8] PCI between hospitals with or without onsite cardiac surgery [9]. In Japan, the proportion of low volume PCI centers (under 200 PCI procedures per year) comprises approximately 80% of all PCI centers, and the proportion of PCI centers without onsite cardiac surgery comprises approximately 53% of all PCI centers [10]. Based on Japanese PCI guideline for ST-segment elevation myocardial infarction (STEMI), it is not recommended that primary PCI be performed in the hospital without onsite cardiac surgery (class IIb = As judged from available opinions, neither the benefits nor the efficacy of a method of evaluation or treatment have been well established) (Guidelines for the management of patients with ST-elevation acute myocardial infarction (JCS2013)). However, it is not clear that there is no difference in clinical outcomes following primary or elective PCI for acute coronary syndrome (ACS) between hospitals with or without onsite cardiac surgery in Japan. Therefore, we examined the impact of with or without onsite cardiac surgery on clinical outcomes following PCI for ACS in Japan.

Methods

Search strategy

We analyzed the data of Kumamoto Intervention Conference Study (KICS) registry [11]. KICS is a physician-initiated, non-company-sponsored, multicenter registry enrolling consecutive patients undergoing PCI in 15 centers in Japan. Between August 2008 and March 2011, 6275 consecutive procedures were recorded on the PCI list. Of these, 56 patients were excluded from the study due to withdrawal of consent, and the remaining 6219 patients who gave written informed consent were enrolled in this study.

In 6219 patients, 3214 patients underwent PCI for ACS. The subjects were assigned to 2 groups, based on whether they had undergone PCI with onsite cardiac surgery ($n = 2764$) or without onsite cardiac surgery ($n = 477$) (Fig. 1). Moreover, we analyzed the patients with STEMI between the hospitals with onsite cardiac surgery ($n = 1409$) or without cardiac surgery ($n = 241$).

The study protocol adhered to the guidelines of the ethics committee of each institution and written informed consent was given by each patient or the family of the patient.

Data collection

The patients' demographic information, history of cardiovascular disease [myocardial infarction (MI), stroke] and their risk factors for cardiovascular disease [current smoking, hypertension (HT), dyslipidemia (DLP), diabetes mellitus (DM), chronic kidney disease (CKD), peripheral artery disease (PAD), and hemodialysis (HD)], were recorded. HT was defined as blood pressure of 140 over 90 mmHg or higher, or use of antihypertensive agents. DLP was defined as low-density-lipoprotein >140 mg/dL, high-density-lipoprotein <40 mg/dL, or triglyceride >150 mg/dL. DM was defined as 2-hour glucose tolerance test finding of at least 200 mg/dL or a fasting glucose level of ≥ 126 mg/dL (≥ 7.0 mmol/L), or HbA1c $\geq 6.9\%$ (National Glycohemoglobin Standardization Program), or physician-diagnosed diabetes and/or use of diabetic medication.

ACS was defined as either an acute myocardial infarction (STEMI or non-STEMI) or unstable angina pectoris (UAP) according to the ACC/AHA guidelines [12,13].

Emergent PCI was defined as patients who underwent PCI within 24 hours from onset ACS. All others were defined as elective PCI.

Angioplasty procedure

PCI was performed according to standard techniques. Conventional treatment was given during angioplasty, including isosorbide-dinitrate and heparin. Additional heparin was administered each hour in long procedures. The technical aspects of the procedure, including the choice of stent and balloon, duration of inflation and pressure were determined by each operator. Successful treatment of the lesion was defined as residual

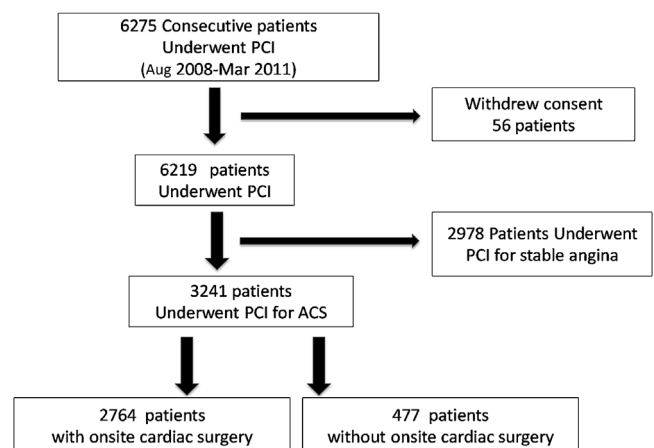


Fig. 1. Trial profile. PCI, percutaneous coronary intervention; ACS, acute coronary syndrome.

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