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Comparison of transradial and transfemoral coronary intervention in octogenarians with acute myocardial infarction

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ABSTRACT

Background: The transradial (TR) approach for percutaneous coronary intervention (PCI) is challenging and associated with failure in elderly patients. We compared the TR and transfemoral (TF) approaches in patients >80 years with acute myocardial infarction (MI) undergoing PCI.

Methods: A total of 1945 (7.2%) octogenarians were enrolled from among 27,129 patients in the Korea Acute Myocardial Infarction Registry. The TR group (n = 336, 17.3%) was compared with the TF group (n = 1609, 82.7%) in the overall and propensity-matched cohorts with respect to procedural success, complications, in-hospital mortality, and one-year mortality and total major adverse cardiac event (MACE; death, MI, and revascularization) rate.

Results: In the overall cohort, the TR group had lower incidence of Killip class III or IV compared to the TF group. The disease extent and lesion severity were similar between groups, as was the procedural success rate (97.7% vs. 98.3%); however, in-hospital complications were significantly lower in the TR group (8.1% vs. 20.3%). In-hospital mortality was significantly lower in the TR group than the TF group (3.4% vs. 11.4%), as were the one-year mortality and total MACE (9.8% vs. 18.4% and 13% vs. 21.9%, respectively). These outcomes were consistent in the propensity-matched cohort. The TR approach was found to be a significant predictor of low in-hospital mortality (OR 0.355, 95% CI 0.139–0.907), but not of one-year mortality (OR 0.644, 95% CI 0.334–1.240).

Conclusions: In octogenarians with acute MI undergoing PCI, the TR approach was more effective than the TF approach as it had lower complication rate and better clinical outcomes with comparable procedural success.

1. Introduction

In recent years, percutaneous coronary intervention (PCI) is being increasingly considered, even for patients of advanced age. In fact, almost 25% of all PCIs are performed in patients aged more than 75 years, and one out of eight PCI patients is an octogenarian [1,2]. Age-related physiological changes are a double-edged sword, because although elderly patients obtain considerable benefits from coronary revascularization, owing to the fact that they tend to have a larger ischemic burden than younger patients [3,4], they are more likely to experience procedure-related complications than younger patients [5–9]. Coronary revascularization trials have generally shown that patients at high risk derive greater benefits from revascularization than those at low risk [10–13]. Therefore, elderly patients, who are more likely to have cardiovascular risk factors, a more severe disease burden, and less compliant hearts, might derive greater benefits from revascularization than younger patients.

The transradial (TR) approach is widely used in PCI because it is more effective in lowering the incidence of complications in vascular access sites and improving patient satisfaction than the transfemoral (TF) approach. However, advanced age is one of the main predictors of failure in the TR approach. Several factors, including age-related advanced vascular disease, increased tortuosity of the subclavian artery, aortic root dilation, calcification, and diffuse atherosclerosis, might explain this association. Previous findings showed that the TR approach is as safe as the TF approach even in octogenarians [14]. Nonetheless, data

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on the TR approach in elderly patients with acute myocardial infarction (MI) are limited. Therefore, in the present study, we aimed to compare the safety and efficacy outcomes between the TR and TF approaches in octogenarian patients with acute MI.

2. Materials and methods

2.1. Study population

The study population comprised patients from the Korea Acute Myocardial Infarction Registry, a prospective, observational multicenter registry started in 2005 that investigates current practices of management, risk factors, and clinical outcomes of acute MI in Korean patients, with the support of the Korean Society of Cardiology.

The study was conducted at approximately 50 hospitals in charge of primary PCI across the country and the study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institution's human research committee of each participating institution. Informed consent for use of data was obtained from each patient. From January 2005 to December 2010, 1945 eligible octogenarians were selected from among 27,129 patients in the registry who presented with acute MI and received PCI, and they were divided into the TR (n = 336; 17.3%) and TF groups (n = 1609; 82.7%). Their data were then analyzed (Fig. 1).

2.2. PCI procedures

The TR approach was performed via the right or left radial artery. Immediately after the procedure, the radial sheath was removed and manual hemostasis was achieved by compressive dressing. In the TF approach group, hemostasis was achieved either manually or via a device-assisted method. Before the procedure, all patients received oral administration of 100–300 mg aspirin and 300–600 mg clopidogrel. Further, intravenous heparin (70 U/kg) was administered to maintain the activated clotting time at >250 s during the procedure. Glycoprotein (GP) IIb/IIIa inhibitor was administered according to the discretion of the operator in the catheterization laboratory.

2.3. Study outcomes and definitions

In the primary analysis, the primary efficacy outcomes were in-hospital mortality; one-year mortality; and major adverse cardiovascular event (MACEs), which were defined as death, MI, and revascularization, including re-PCI and coronary artery bypass graft surgery (CABG). The safety outcomes were the procedural success rate and in-hospital complications. In the secondary analysis, we compared the clinical outcomes between the TR and TF groups in the ST-elevation myocardial infarction (STEMI) subgroup. Further, the clinical outcomes were also compared between the TR and TF groups by using propensity-score matching in the overall cohort.

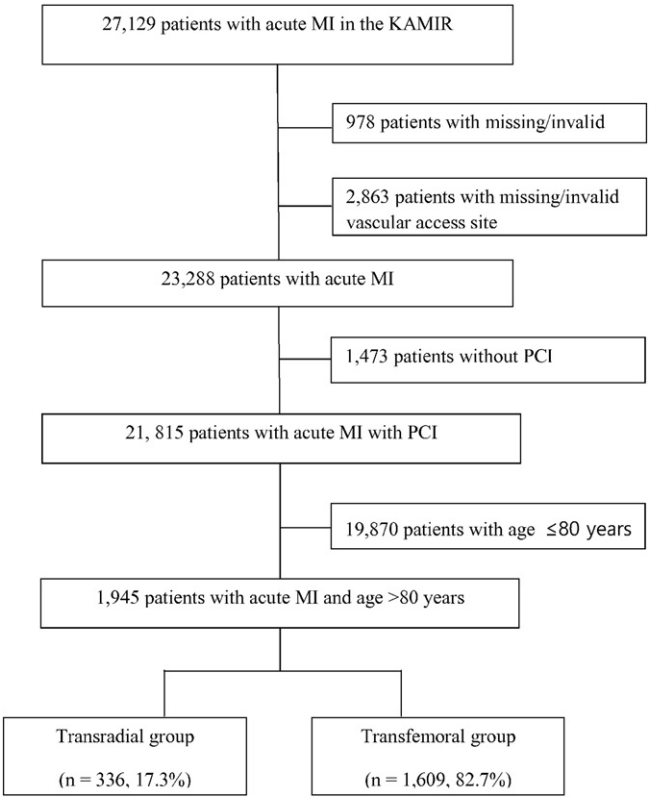

Fig. 1. Flow diagram of study population. MI = myocardial infarction; KAMIR = Korean Acute Myocardial Infarction Registry; PCI = percutaneous coronary intervention.

In-hospital complications encompassed all kinds of reported complications, as well as some pre-defined ones [15]. These included atrioventricular block or arrhythmic events that needed pharmacological and/or electrical interventions, progression to cardiogenic shock, new-onset heart failure, re-infarction, acute renal failure, multi-organ failure, cerebrovascular events, major bleeding, and any complications during hospitalization. Re-infarction was defined as recurrent symptoms with new ST-segment elevation or re-elevation of cardiac markers to at least twice the upper limit of normal. Major bleeding was defined as any intracranial bleeding, bleeding associated with the need for blood transfusion, or any other clinically relevant bleeding, as judged by the investigator. All events were reported at the treating physician's discretion after he or she considered the patient's in-hospital examination results.

2.4. Statistical analysis

All statistical analyses were performed using SPSS software version 18.0 (SPSS-PC Inc., Chicago, IL, USA). Continuous variables are presented as mean value ± standard deviation or median and interquartile ranges (25th, 75th percentile) depending on whether or not they showed normal distribution, and were compared using independent Student's t-test or the Mann–Whitney *U*-test, where appropriate. Categorical variables are presented as numbers and percentages, and were compared using Pearson's χ^2 test or Fisher's exact test, where appropriate. To identify the independent predictors of in-hospital and one-year mortality, uni- and multivariate logistic regression analyses were conducted.

For further adjusted analyses, the propensity score model was created to compare the TR group with the TF group. We estimated propensity score for approach type using a non-parsimonious multiple logistic regression model. In this model, approach type was used as the dependent variable, and a total of 17 variables related to the baseline clinical, angiographic, procedural and treatment-related characteristics were chosen as independent variables (age, sex, Killip class, hypertension, diabetes mellitus, dyslipidemia, current smoking status, prior MI, prior PCI, prior cerebrovascular accident, final diagnosis, number of involved vessels, target vessel, lesion type, stent implantation, procedural success, and overall complications). The model was well calibrated with good discrimination. With the optimal 1:1 digit-match algorithm, we created 336 propensity score-matched pairs without replacement. After propensity score matching, we checked the balance in baseline covariates between the TR and TF groups using McNemar's test and a paired t-test or the Wilcoxon signed rank test. The adjusted odds ratios (ORs) for comparison in the propensity-matched cohort were calculated using multivariate logistic regression analysis. p-Value <0.05 was considered significant.

3. Results

3.1. Baseline characteristics of the study populations

Of the total of 1945 octogenarian patients, 336 patients (17.3%) were treated with the transradial (TR) approach and 1609 patients (82.7%) were treated with the transfemoral (TF) approach. Baseline characteristics between the two groups are shown in Table 1. The mean age was 83 years and approximately 45% of the patients were male. Patients in the TR group had a significantly lower incidence (15.0% vs. 24.1%) of Killip class III or IV compared to those in the TF group. There were a great number of STEMI patients in the TF group than in the TR group. The disease extent and lesion severity were similar between the groups, as was the procedural success rate (97.7% vs. 98.3%); however, in-hospital complications were significantly lower in the TR group (8.1% vs. 20.3%). After propensity score matching was performed for the entire population, there were 336 matched pairs of patients. In the matched cohort, all of the characteristics of the two groups were comparable.

3.2. Clinical outcomes

The procedural success rate was approximately 98% in both groups, and the difference was not statistically significant (p = 0.577). The incidence of in-hospital complications was significantly lower in the TR group than the TF group (8.1% vs. 20.3%, p < 0.0001), with no differences in the rates of acute kidney injury, major bleeding, cerebrovascular events, and vascular access site complications observed (Table 2). The IABP insertion rate was significantly higher in the TF group than in the TR group (6.4% vs. 1.5%, p < 0.0001). The in-hospital mortality rate was significantly lower in the TR group than in the TF group (3.4% vs. 11.4%, p < 0.0001). The incidence of cardiac death was also significantly