Hospital Volume and Outcomes of Coronary Atherectomy

Calcified coronary plaques often require percutaneous coronary intervention (PCI).[1,2] Heavy calcification may hinder stent expansion and apposition and has been associated with high rates of target lesion revascularization and adverse cardiac events.[1,2] Coronary atherectomy can facilitate treatment of severely calcified lesions, but carries risk of complications that might in part be mitigated by extensive experience in use of those devices. We examined the association between atherectomy volume and in-hospital mortality after atherectomy-facilitated PCI in a large inpatient registry.

The Nationwide Readmission Database (NRD) for 2016-2017 was queried to identify hospitalizations with ICD-10 procedure codes for PCI. Hospitalizations for coronary atherectomy (rotational or orbital) were identified using the appropriate ICD-10 codes.[1] Hospitals were classified into tertiles according to annual procedural volume for any coronary atherectomy procedures: low-volume (<15 procedures), moderate-volume (15 to 42 procedures), and high-volume (>42 procedures). Using multivariable regression analysis, we evaluated the association between the annual hospital atherectomy volume and in-hospital mortality after PCI with any coronary atherectomy device (i.e., rotational or orbital atherectomy). Hospital atherectomy volume was analyzed both as categorical and continuous variable. The multivariable model adjusted for the following variables: age, sex, race, diabetes, hypertension, long-term liver disease, heart failure, long-term kidney disease, long-term lung disease, valvular heart disease, obesity, peripheral arterial disease, pulmonary circulation disorders, presentation with ST-segment elevation myocardial infarction, presentation with cardiogenic shock and use of mechanical circulatory support. All analyses were conducted using multi-level complex analysis, to account for hospital clustering, weights and stratification. All analyses were conducted using the SPSS software (IBM SPSS Statistics for Windows, Version 25.0. Armonk, New York: IBM Corp Released 2017). The study was exempt by the institutional review board since data are publicly available and de-identified.

During the study period 85,123 hospitalizations involved inpatient PCI with coronary atherectomy (77,795 [91.4%] cases were performed with rotational atherectomy and 7,328 [8.6%] cases with orbital atherectomy) as follows:. (4,276 [5.0%] at low atherectomy volume hospitals, 16,679 [19.6%] at moderate-volume hospitals, and 64,167 [75.4%] at high-volume hospitals). The study cohort had a mean age of 65 ± 13 years, 29% were women, 60.7% had hypertension, 37.5% had diabetes mellitus, 12.1% had peripheral arterial disease and 18.1% had chronic kidney disease. Most patients (n = 59,675, 70.1%) presented with acute myocardial infarction. Low-volume hospitals were less likely to utilize mechanical circulatory support compared with moderate- and high-volume hospitals (8.8% vs 10.5% vs 12.1%, p<0.001). Compared with low-volume hospitals, in-hospital mortality after coronary atherectomy was lower among moderate-volume (6.1% vs 5.1%, adjusted-odds ratio [OR] 0.87; 95% confidence interval [CI] 0.77 to 0.99) and high-volume hospitals (6.1% vs 4.9%, adjusted-OR 0.66; 95% CI 0.54 to 0.81). When analyzing hospital atherectomy volume as a continuous variable, in-hospital mortality after any coronary atherectomy was lower with increasing hospital atherectomy volume (adjusted-OR 0.994; 95% CI 0.991 to 0.996) (Figure 1). Compared with low-volume hospitals**,** coronary atherectomy was associated with lower rate of cardiac arrest among high-volume hospitals (adjusted-OR 0.91; 95% CI 0.82 to 0.99) but similar rates among moderate-volume hospitals (adjusted-OR 0.88; 95% CI 0.75 to 1.04). There were no differences according to annual hospital atherectomy volume and other study outcomes including: cardiogenic shock, acute kidney injury, acute stroke, coronary dissection or perforation, blood transfusion or pacemaker insertion.

In a subgroup analysis according to atherectomy type, a volume-outcome association was observed with rotational atherectomy but not with orbital atherectomy. Compared with low-volume hospitals, in-hospital mortality after rotational atherectomy was lower among high-volume hospitals (adjusted-OR 0.65; 95% CI 0.53 to

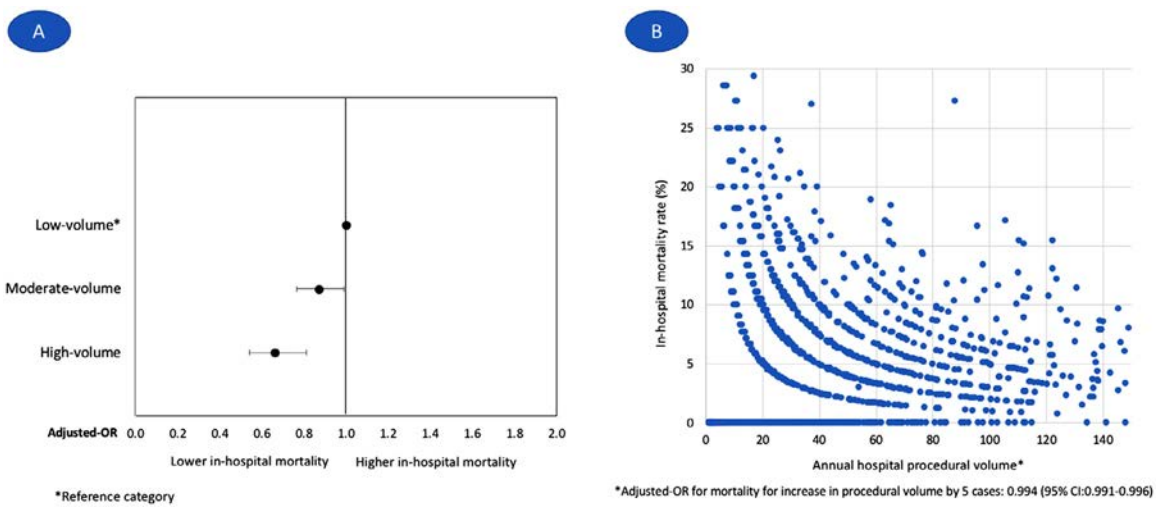

Figure 1. *Panel A*: Association between tertiles of hospital atherectomy volume and in-hospital mortality after coronary atherectomy. *Panel B*: Association between hospital atherectomy volume as a continuous variable and in-hospital mortality after coronary atherectomy.

0.80) and similar among moderate-volume hospitals (adjusted-OR 0.89; 95% CI 0.77 to 1.01). While compared with low-volume hospitals, no difference was observed after orbital atherectomy among moderate-volume (adjusted-OR 2.66; 95% CI 0.59 to 12.01) and high-volume-hospitals (adjusted-OR 0.74; 95% CI 0.47 to 1.19).

Our analysis is limited by the administrative nature of the database and the lack of long-term outcomes. The overall high mortality observed in our study is likely due to high anatomic and clinical complexity of the treated lesions and patients in addition to any potential risk conferred by atherectomy. The finding of better outcomes with higher procedural volume has been observed with other complex procedures, such as chronic total occlusions,[3] and left main interventions[4] and may be related to better procedural technique and better preparedness for handling complications should they occur.[3,4] Whether routine atherectomy may improve the outcomes of PCI of heavily calcified lesions is currently being examined in the Evaluation of Treatment Strategies for Severe CaLcIfic Coronary Arteries (ECLIPSE)trial (NCT 03108456).

Disclosures

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