Predictors of Bleeding Complications After Rescue Coronary Interventions

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Abstract. The purpose of this study was to determine predictors of bleeding complications after current rescue coronary interventions including stenting and adjunctive platelet inhibitors. Previous studies of rescue angioplasty for thrombolytic failure have identified variable rates of bleeding complications with balloon angioplasty alone. Although coronary stents and glycoprotein 2b/3a inhibitors have been shown to improve outcome in a wide variety of coronary interventions, the impact of these therapies on bleeding complications after rescue coronary intervention has not been determined. From 1996 through 1998, we treated 108 consecutive patients with rescue coronary intervention (defined as attempted coronary intervention within 12 hours of thrombolysis for ongoing symptoms or electrocardiogram [ECG] changes) including conventional percutaneous transluminal coronary artery (PTCA), stenting (n = 45), and glycoprotein 2b/3a inhibitor use (n = 31). In-hospital clinical outcomes were obtained in all patients, and univariate and multivariate predictors of bleeding complications were identified. In hospital, moderate to severe bleeding complications occurred in 17.6% of the cohort, but the rate of severe bleeding complications (2.7%) and vascular repair (1.9%) were low. Independent predictors of bleeding complications were age > 60 y, female gender, cardiogenic shock, and streptokinase use. Neither the delayed use of abciximab (on average 4 hours after thrombolytic therapy initiation) nor the use of rescue stenting were predictors of increased moderate to severe bleeding complications. Current rescue coronary intervention, including stents and platelet inhibitors, is associated with high in-hospital complication rates, including bleeding complication rates as high as 39% [5,6]. Although recent data from the Global Use of Strategies to Open Occluded arteries (GUSTO) trial suggest that bleeding complication rates after rescue angioplasty may be as low as 8.6% [7], the reason for this wide variation in bleeding rates is unclear. To date, there have been no analyses to identify predictors of bleeding complications after rescue angioplasty, and thus risk stratification for bleeding complications following rescue coronary intervention has not been addressed.

Furthermore, the practice of both routine and emergent coronary intervention has changed since the GUSTO trial to include glycoprotein 2b/3a inhibitors [8–11] and coronary stent placement [12–15]. The effect of stenting and platelet inhibitors on the already concerning rate of bleeding complications for rescue intervention is not well-established. Two small series have suggested that the use of glycoprotein 2b/3a inhibitors in the setting of rescue angioplasty is contraindicated due to increased bleeding complications, but neither study examined the independent effect of abciximab on bleeding rates [16,17]. Similarly, the addition of oral platelet inhibitors to aspirin therapy following rescue stenting might be associated with increased bleeding complication rates, as was seen with elective coronary stenting in the STent Anticoagulation Regimen Study (STARS) trial [18]. In order to determine the importance of these factors in current rescue intervention complication rates, we analyzed a registry of 108 consecutive patients undergoing rescue angioplasty during the past 3 years for independent predictors of bleeding complications.

Current thrombolytic agents fail to restore coronary artery patency in 17–45% of patients with acute myocardial infarction [1–4]. The subsequent invasive treatment of patients with failed thrombolysis—rescue angioplasty—has been associated with high in-hospital complication rates, including bleeding complication rates as high as 39% [5,6]. Although recent data from the Global Use of Strategies to Open Occluded arteries (GUSTO) trial suggest that bleeding complication rates after rescue angioplasty may be as low as 8.6% [7], the reason for this wide variation in bleeding rates is unclear. To date, there have been no analyses to identify predictors of bleeding complications after rescue angioplasty, and thus risk stratification for bleeding complications following rescue coronary intervention has not been addressed.

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Methods

Study population
From 1996–1998, 108 consecutive patients underwent rescue angioplasty for ongoing infarction after thrombolytic therapy at the University of Massachusetts Memorial Medical Center. These patients were identified retrospectively (1996–1997) and prospectively (1998) as part of a rescue angioplasty registry. All patients were within 12 hours of thrombolytic therapy and had electrocardiographic or symptomatic evidence of thrombolytic failure. All rescue angioplasty patients were included in the registry, including those in cardiogenic shock (defined as systolic blood pressure <80 mm Hg or pressor requirement despite fluid boluses). Of these 108 patients, 63 were treated with balloon angioplasty alone, and 45 were treated with coronary stenting. Heparin anticoagulation alone was used in 77 patients, and adjunctive abciximab was used in 31 patients. The choice of treatment modalities was determined by the individual operator (7 operators in total). Coronary stenting and abciximab use were more common in 1998 than they were in 1996–1997.

Interventional procedures and definitions
Patients were treated with 325 mg of aspirin and heparin prior to arrival in the catheterization laboratory, and additional boluses of heparin were administered once arterial access was achieved to reach an activated clotting time (ACT) of 300–350 seconds. Thrombolytic therapy was discontinued prior to arrival to the catheterization laboratory in all cases. Coronary angioplasty was performed using a standard technique with a balloon:artery ratio of 1.1:1 through 8.5 French arterial sheaths. Venous sheaths were placed in all patients, as is the practice with all acute myocardial infarction interventions in this cardiac catheterization lab. Intracoronary stenting was performed as previously described [18]. Patients received either Palmaz-Schatz (n=7), ACS Multilink (n=19), Duet (n=8), or AVE GFX (n=11) coronary stents followed by high-pressure balloon inflation at >12 atm for 30–90 seconds using semi compliant or noncompliant balloons. Intravenous abciximab was administered at the discretion of the operator in selected cases, and intravenous heparin was administered to achieve an ACT of 225–275 seconds in these cases.

Following the revascularization procedure, vascular access sheaths were removed 12 hours after the coronary intervention because of concerns about increased bleeding risk in the post-thrombolytic state: fibrinogen levels were not checked routinely. After successful revascularization, all patients were treated with aspirin indefinitely and all stented patients received both aspirin and ticlopidine 250 mg twice daily for 1 month. Four stented patients were also treated with warfarin anticoagulation.

Death was defined as all-cause mortality. Stroke was defined as a new neurological deficit persisting for at least 24 hours. Moderate to severe bleeding complications were classified according to the definitions in the GUSTO and Platelet glycoprotein IIb/IIIa in Unstable angina Receptor Suppression Using Integrilin Therapy (PURSUIT) studies [11,19]: severe bleeding was defined as intracranial bleeding or bleeding that caused hemodynamic compromise, and moderate bleeding was defined as bleeding that required blood transfusion but that did not lead to hemodynamic compromise. Minor bleeding complications were not considered in this analysis. Patients who received transfusions after coronary artery bypass surgery were not included as bleeding complications. Severe thrombocytopenia was defined as platelet count less than 50,000.

Statistical analysis
Variables recorded included information on demographics, thrombolytic therapy and timing, interventional devices and anticoagulant use, laboratory abnormalities associated with bleeding, transfusions, surgical interventions, and major adverse cardiac end points. SAS software (SAS Inc. Cary, NC) was used for statistical analysis. Discrete data are presented as frequencies, and continuous data as mean plus or minus standard deviation. Continuous data were compared using Students t-test, and the discrete variables were compared using the chi-squared test. A p value <0.05 was considered statistically significant. Multivariable logistic regression analysis was used to identify independent predictors of bleeding complications while adjusting for all recorded clinical and procedural variables and variables identified as predictors of bleeding complications in the univariate analysis.

Results

Patient characteristics
The baseline clinical characteristics of the registry group are summarized in Table 1. Cardiogenic shock was present in nearly 20% of the group, and the culprit vessel was initially occluded in nearly 60% of patients. Alteplase was the thrombolytic agent used in 94% of patients. The median time from thrombolytic initiation to arrival in the cardiac catheterization lab was nearly 4 hours.