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Thirty-day readmission after lower extremity bypass in diabetic patients

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ABSTRACT

Background: Lower extremity bypass (LEB) for peripheral vascular disease is a common procedure in diabetics and is associated with readmission. Thus, we hypothesized that diabetes might be a predictor of 30-d unplanned readmission after LEB.

Methods: Patients undergoing infrainguinal LEB in the 2011–12 American College of Surgeons National Surgery Quality Improvement Program database were divided into nondiabetics mellitus (NDM), non–insulin-dependent diabetics mellitus (NIDDM), and insulin-dependent diabetic mellitus (IDDM). Univariate and multivariate analyses were used to evaluate the influence of diabetes on 30-d readmission.

Results: A total of 9207 patients (5155 [56%] NDM, 1690 (18%) NIDDM, and 2362 (26%) IDDM) underwent LEB. Unplanned readmission was observed in 1448 patients (16%). IDDM had significantly higher crude postoperative complication (43% *versus* 30% NDM, 36% NIDDM; $P < 0.001$) and unplanned readmission rates (20% *versus* 14% NDM, 16% NIDDM; $P < 0.001$). Concomitant cardiac disease significantly modified the association between diabetes and unplanned readmission. On multivariable analysis, IDDM was an independent predictor of unplanned readmission in the absence of cardiac disease (odds ratio [OR] = 1.23; 95% confidence interval [CI], 1.03–1.47; $P = 0.01$). However, this association did not remain significant in the presence of cardiac disease (OR = 0.70; 95% CI, 0.48–1.01; $P = 0.56$). On subgroup analysis of those without cardiac disease, cardiac complications were a significant risk factor for readmission in IDDM (OR = 2.00; 95% CI, 1.12–3.57; $P = 0.02$) but not NDM ($P = 0.31$) or NIDDM ($P = 0.10$).

Conclusions: Although post-LEB unplanned readmission was more common among diabetics, IDDM was independently associated with unplanned readmission only in those without cardiac disease. This was driven, in part, by increased cardiac complications.

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Therefore, a more stringent preoperative cardiac workup in this group should be considered before LEB.

1. Introduction

Unplanned readmission is associated with significant additional hospital costs [1]. Over the last decade, Medicare spent over $174 billion on unplanned readmission [2]. Given this negative economic impact and the association of unplanned readmission with morbidity and mortality, it has become a focus of health care quality improvement and a target of health care reform [1,3–7]. To reduce avoidable readmissions, the Patient Protection and Affordable Care Act established a "Hospital Readmission Reduction Program." According to this policy, hospitals with higher than expected adjusted rehospitalization rates would have a lower reimbursement rate [1,2].

Review of Medicare claims database demonstrated that vascular surgery patients have one of the highest risks for unplanned readmission [8]. The most common reasons for readmission after a vascular procedure include wound infection or complications, vascular complications, graft failure, and cardiopulmonary complications [9]. On average, readmission after vascular surgery adds $12,400 in direct hospital costs [10] and would be associated with up to $1 billion in penalties overall [11]. Because many of the readmissions associated with vascular surgery are preventable, vascular surgery could potentially be considered as one of the targets for high-readmission penalty [8]. Infrainguinal lower extremity bypass (LEB) is one of the vascular procedures associated with a high 30-d unplanned readmission rate of 14%–19% [7,9,12–15]. LEB is a common vascular procedure in patients with diabetes mellitus (DM) who are well known for developing perioperative complications and unplanned readmission [16,17]. However, it is not clear whether DM *per se* is an independent predictor of unplanned 30-d readmission after LEB and what effects insulin dependence may have on this association.

To answer the previously mentioned question, this study aimed to compare 30-d unplanned readmission after LEB between diabetics and nondiabetics using the American College of Surgeons National Surgery Quality Improvement Program (ACS-NSQIP) database.

2. Methods

2.1. Data source

Data were extracted from the 2011–2012 ACS-NSQIP Participant Use Data File. The ACS-NSQIP is a national, multicenter, prospective clinical and administrative database with a mission of improving perioperative outcomes. ACS-NSQIP collects 240 Health Insurance Portability and Accountability Act compliant preoperative, intraoperative, and postoperative variables of patients aged >18 y from 374 participating academic and community hospitals [18].

In ACS-NSQIP, data points for every systematically sampled surgical procedure are captured by a trained surgical clinical reviewer. Surgical clinical reviewers use various methods such as medical record abstraction to populate the database [18,19]. Although not all cases from participating sites are included in this database, case inclusion in ACS-NSQIP is based on a systematic sampling method to prevent selection bias. To validate accuracy, the ACS-NSQIP data undergo a regular rigorous annual audit process [20,21]. This study was approved by the Johns Hopkins Hospital Institutional Review Board. As all patients are deidentified, informed consent was not obtained.

Participating hospitals provide 30-d postoperative outcome information on at least 95% of patients [22]. Since 2011, a new variable for 30-d readmission has been added to the follow-up. This variable captures all principle procedure-related readmissions to any hospital —including non–NSQIP institutions—within 30 d postoperatively [1]. From 2012, another variable was added to the database to determine the primary suspected reason for unplanned readmission. Further detailed and updated information on different aspects of the ASC-NSQIP database is available on its official Web site [23].

2.2. Study criteria

Patients undergoing infrainguinal bypass were identified using current procedure terminology codes including 35556, 35566, 35570, 35571, 35583, 35585, 35587, 35656, 35666, and 35671. Exclusion criteria included concomitant suprainguinal procedure, primary postoperative diagnosis of acute ischemia (International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis codes of 444.0–444.9), death over the follow-up period, planned readmission, hospitalization >30 d and missing information for age, and diabetes status or 30-d unplanned readmission. Detailed patient selection process is depicted in the study flow diagram (Figure).

2.3. Variables

Demographic and baseline characteristics, preoperative, operative, and postoperative factors were collected. Demographic and baseline characteristics included age, gender, race, body mass index (underweight [<18.5], normal [18.5–24.9], overweight [25.0–29.9], or obese [≥30 kg/m^2]), smoking (active cigarette smoking within 1 y before surgery), alcohol use (>2 drinks per day within 2 wk before surgery), level of bypass (femoral–popliteal, femoral–tibial, or popliteal–tibial/tibial-tibial), American Society of Anesthesiologists' (ASA) classification (regrouped into 1 or 2 [healthy or mild disease], 3 [severe disease], and 4 or 5 [systemic or moribund]), functional status, and transfer status.

Preoperative factors included diabetes status (nondiabetic mellitus [NDM], non–insulin-dependent diabetic mellitus [NIDDM], and insulin-dependent diabetic mellitus [IDDM]),