Published in final edited form as:

J Thromb Thrombolysis. 2017 February ; 43(2): 194–202. doi:10.1007/s11239-016-1441-5.

Bleeding risk associated with eptifibatide (Integrilin) bridging in thoracic surgery patients

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Abstract

Objective—Antiplatelet use for treatment of coronary artery disease (CAD) is common amongst thoracic surgery patients. Perioperative management of antiplatelet agents requires balancing the opposing risks of myocardial ischemia and excessive bleeding. Perioperative bridging with short-acting intravenous antiplatelet agents has shown promise in preventing myocardial ischemia, but may increase bleeding. We sought to determine whether perioperative bridging with eptifibatide increased bleeding associated with thoracic surgery.

Methods—After Institutional Review Board approval, we identified thoracic surgery patients receiving eptifibatide at our institution (n=30). These patients were matched 1:2 with control patients with CAD who did not receive eptifibatide from an institutional database of general thoracic surgery patients. The primary endpoint for our study was the number of units of blood transfused perioperatively.

Results—There were no differences in our primary endpoint, number of units of blood products transfused. There were also no differences noted between groups in intraoperative blood loss, chest tube duration, or postoperative length of stay (LOS). While there were no difference noted in overall complications, including our outcome of perioperative MI or death, composite cardiovascular events were more common in the eptifibatide group.

Conclusions—In our retrospective exploratory analysis, eptifibatide bridging in patients with high-risk or recent PCI was not associated with an increased need for perioperative transfusion, bleeding, or increased LOS. In addition, we found a similar rate of perioperative mortality or myocardial infarction in both groups, though the ability of eptifibatide to protect against perioperative myocardial ischemia is unclear given different baseline CAD characteristics.

Conflicts of Interest: None of the authors have conflicts of interest to declare relating to this work.

Keywords

Antiplatelet; perioperative; bridging; thoracic surgery; coronary artery disease

Introduction

Patients undergoing thoracic surgery often have multiple comorbidities, including coronary artery disease (CAD), with an incidence of 16% at our institution ¹ and 27.5% nationally ². In addition, data from a cohort of Veterans Administration patients suggest that up to 10% of patients undergoing pulmonary resection had CAD treated with coronary artery bypass grafting or percutaneous coronary intervention (PCI) ³. The high risk of postoperative complications and managing associated medications must be considered in this patient group.

Prevention of post-PCI stent thrombosis relies on the use of antiplatelet agents, including P2Y₁₂ inhibitors such as clopidogrel, prasugrel or ticagrelor. In fact, current guidelines recommend dual anti-platelet therapy (DAPT) with aspirin as well a P2Y₁₂ inhibitor for a minimum of 1 year after drug-eluting stent (DES) and one month after bare metal stent ⁴. Premature cessation of antiplatelet therapy is associated with highly morbid in-stent thrombosis ^{5, 6}.

Patients on DAPT for a recent PCI requiring non-elective surgery are a unique, high-risk population. Clinicians treating these patients must weigh the opposing risks of in-stent thrombosis, due to both cessation of anti-platelet therapy and the pro-thrombotic response to surgery, versus excessive bleeding due to continued or residual antiplatelet effect. In July 2010, we instituted an eptifibatide (Integrilin) bridging algorithm to optimize outcomes in patients with recent or high risk PCI on DAPT requiring non-elective thoracic surgery. This algorithm was instituted in the face of clinical concern and empirically determined in the absence of definitive clinical trial evidence.

To our knowledge, the use of an eptifibatide bridge has not been systematically examined in thoracic surgery patients presenting for surgery on DAPT after PCI or with high-risk coronary lesions. The purpose of our study was to evaluate perioperative outcomes in our single center for patients undergoing eptifibatide bridging prior to thoracic surgery. We hypothesized that, compared to matched controls, thoracic surgery patients with recent or high risk PCI bridged with eptifibatide would not have significantly increased bleeding requiring blood product transfusion.

Materials and Methods

After approval by our local Institutional Review Board, cases were identified by querying a pharmacy database for all thoracic surgery patients receiving eptifibatide from July 2008 to March 2013; controls were identified by a matching algorithm from institutional databases of thoracic surgery patients as described below. Control patients were required to have a documented medical history of CAD. Transfusion data were obtained by cross-referencing data from the Duke University Hospital Blood Bank database with our study database.

Patient characteristics (demographics, preoperative comorbidities and intraoperative details) and postoperative events were abstracted from the medical record. Deaths were captured both by chart review and use of the Social Security Death Index Database.

Bridging strategy

We instituted a routine eptifibatide bridging algorithm starting in July 2010 according to a multidisciplinary cardiology, cardiothoracic anesthesiology, and thoracic surgery protocol. In brief, high-risk patients (DES placement within prior year, off-label use of coronary stent, left main or proximal left anterior descending artery location, or previous coronary event after P2Y₁₂ inhibitor discontinuation) stopped P2Y₁₂ inhibitors 5 days preoperatively and were admitted 2 to 3 days preoperatively and bridged with the short-acting intravenous glycoprotein IIb/IIIa receptor inhibitor eptifibatide (Integrilin®, Millenium Pharmaceuticals, Massachusetts). Eptifibatide was infused at 2 µg·kg⁻¹·min⁻¹, or 1 µg·kg⁻¹·min⁻¹ if creatinine clearance was < 60 mL·min⁻¹ and discontinued 8 hours before surgery. Patients with end-stage renal disease or on dialysis were excluded per eptifibatide labeling instructions. All patients were continued on aspirin throughout the perioperative period and P2Y₁₂ inhibitors were reinitiated 12 to 48 hours after surgery with a loading dose when possible, or at the daily maintenance dose of regardless of surgical approach or extent of resection (Figure 1). Prior to July 2010, patients with recent or high-risk PCI treated according to the above protocol are included in this analysis.

Conduct of surgery

Quantitative evaluation of platelet function was not routine. Thoracoscopic procedures, including lobectomy, were performed without any rib spreading, with the thoracoscope placed in the 8th intercostal space in the mid-axillary line and a 4-cm to 5-cm anterior utility incision in the 5th intercostal space. When performed, thoracotomy was through standard posterolateral approach with sparing of the serratus muscle. Hemostatic agents or sealants were not used on a routine basis in the patients in this study. Chest tubes were routinely placed on water seal immediately postoperatively and removed when no air leak was present and 24-hour drainage was less than 200 mL. Chest tube management for patients receiving P2Y₁₂ inhibitors did not differ from the management used in general for lung resection patients, and the timing of P2Y₁₂ inhibitor reinitiation did not depend on the presence of a chest tube.

Outcome definitions

Postoperative complications, along with all operative deaths, which were defined as deaths that occurred within 30 days after operation or during the index hospitalization, were abstracted from the medical record by two independent observers (TD and NHW). The definitions of postoperative events were based on The Society of Thoracic Surgeons General Thoracic Surgery Database⁷. Overall morbidity was defined as the occurrence of at least one postoperative event.

The primary endpoint for our study was number of units of blood transfused in the perioperative period. Secondary outcomes included a composite outcome of perioperative myocardial infarction or death (MACE), hospital length of stay (LOS), intraoperative blood

loss, chest tube duration, and the proportion of postoperative events (wound, pulmonary, cardiovascular, thrombotic, gastrointestinal, neurologic, infectious, and genitourinary complications) as defined by the Society of Thoracic Surgeons database.

Statistical analysis

Patients who had received perioperative eptifibatide were matched 1:2, using an institutional database of patients having thoracic surgery from 1996–2012 and a greedy matching algorithm, with control patients with CAD who did not receive eptifibatide. Control patients were consecutively identified using a computer program that compared each study patient to all remaining patients in the database who had not been given eptifibatide. The matching algorithm calculated a value of the distance between the study patient and potential control patient from the database using a weighted formula that considered age, type of surgery, surgical approach (open versus minimally invasive/VATS), and required history of CAD for entry into the algorithm. The patient from the database with the minimum distance was selected as the control for that study patient and removed from future consideration for other study patients. This comparison was repeated for each study patient, and then the entire process was repeated for all study patients to form the 1:2 control group.

Continuous data was examined for normality prior to analysis. Hospital LOS was found to have a log-normal distribution, and so a log transformation was performed prior to analysis. Continuous data was analyzed with unpaired Student's *t* tests or the Wilcoxon rank-sum tests as appropriate. Fisher's exact or χ^2 tests were used to analyze categorical variables. To further test our primary hypothesis, patients were classified into four groups of red blood cell transfusion—no units, 1–2 units, 3–5 units, or >5 units transfused, and the Mantel-Haenszel test was used to examine potential linear associations between eptifibatide use and blood transfusion. In addition, the decrease in hemoglobin from preoperative to postoperative day 1 was compared between groups. Rare event rates were described to identify possible trends or patterns. A two-tailed *p* value of less than 0.05 was considered significant. Data are presented as mean $\pm$ SD unless otherwise noted. The SAS 9.3 statistical package (SAS Institute, Cary, NC) and R version 3.1.1 was used for statistical analyses.

Results

Between July 2008 to March 2013, 33 patients had thoracic surgery and received eptifibatide perioperatively. One encounter was found to be a duplicate, and one patient had two separate procedures one month apart and received an eptifibatide bridge both times, resulting in 34 encounters. In the majority (*n*=30, 88%) of encounters, eptifibatide was administered as a bridge after discontinuation of DAPT. We excluded 4 patients from further analysis due to eptifibatide use to treat postoperative myocardial infarction without bridging (*n*=2), transient use of eptifibatide distant from surgical intervention (*n*=1), and late postoperative eptifibatide use after diagnosis of heparin-induced thrombocytopenia (*n*=1). The remaining 30 eptifibatide patient encounters were analyzed (Figure 2).

The eptifibatide group was matched with 69 patients with coronary artery disease undergoing thoracic surgery who did not receive perioperative eptifibatide (controls). Demographics, comorbidities, and surgical characteristics are shown in Table 1. The groups

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were well matched on variables included in the matching algorithm (age, type of surgery, and VATS). The cohorts were also similar in terms of demographics and comorbidities, including factors known to impact risk of bleeding,⁸ though patients in the eptifibatide group were more likely to carry a diagnosis of peripheral vascular disease ($p=0.02$), with a trend toward increased history of myocardial infarction ($p=0.06$) and aspirin use ($p=0.08$) in patients receiving eptifibatide. In addition, patients in the eptifibatide group were more likely to have coronary artery stents ($p<0.0001$), drug-eluting stents ($p<0.0001$), stents <1 year old ($p=0.0002$), and take P2Y₁₂ inhibitors (primarily clopidogrel; $p<0.0001$). Information about stent location was unavailable in nearly half ($n=33$) of control patients, and so this variable was not compared between groups. Seventy-seven percent of patients in the eptifibatide group (23 of 30) and 78% of patients in the control group (54 of 69) were approached thoroscopically. There was a greater proportion of wedge resections in the control group ($p=0.005$), and a greater proportion of miscellaneous procedures (including thoroscopic mediastinal biopsies and decortication) in the eptifibatide group ($p=0.007$).

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Postoperative outcomes are listed in Table 2. There were no differences in our primary endpoint, number of units of blood products transfused (Figure 3), and the Mantel-Haenszel test revealed no linear relationship between red blood cell transfusion and group (CMH $M2=0.055$, $p=0.8152$). Additionally, a similar proportion of patients in both groups required red blood cell transfusion (26.1% vs. 30%), plasma transfusion (5.8% vs. 6.7%), and platelet transfusion (7.3% vs. none) in the control and eptifibatide groups, respectively. Moreover, there was no significant difference in the perioperative decrease in hemoglobin between the control and eptifibatide groups (1.39g/dL vs. 1.00 g/dL respectively, $p=0.24$). There were no differences noted between groups in our composite outcome of MACE, intraoperative blood loss, or chest tube duration. After log transformation, overall hospital LOS was longer in the eptifibatide group ($p=0.0002$), though there were no differences in postoperative LOS ($p=0.69$).

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There was no difference noted in the overall rate of complications. However, composite cardiovascular events (myocardial infarction, cardiac arrest, cardiac failure, arrhythmia, thromboembolism, need for pacemaker) were more common in the eptifibatide group, with $n=11$ (37%) of patients having a cardiovascular complication in the eptifibatide group, compared to $n=11$ (16%) in the control group ($p=0.02$). In the eptifibatide group, these events were primarily (7/11) atrial fibrillation, but there was also one myocardial infarction, one patient who suffered repeated episodes of ventricular fibrillation, one patient who had a pulseless electrical activity arrest secondary to respiratory decline, and a patient who had right ventricular failure treated with inotropic support and inhaled nitric oxide. The myocardial infarction occurred in a patient with prior coronary artery bypass grafting and multiple bare metal stents to both her vein graft and right coronary artery, who suffered an inferior ST-elevation myocardial infarction on postoperative day 1, which was medically managed due to inability to lay flat for cardiac catheterization. There were two deaths in the eptifibatide group. One patient with a history of recurrent ventricular arrhythmias and implantable cardioverter-defibrillator died on postoperative day 5 after sustaining a ventricular fibrillation-induced cardiac arrest (mentioned above). This patient expired before a diagnosis of MI was confirmed or refuted. Another patient suffered from multiple organ dysfunction syndrome after an Ivor-Lewis esophagectomy and expired on postoperative day

7, which was considered unrelated to coronary artery disease. There were five deaths in the control group. Three patients had progressive respiratory decline requiring persistent ventilator support, and the decision was made to withdraw care. Another patient suffered from postoperative mesenteric ischemia and multisystem organ failure, and care was withdrawn. Finally, another patient suffered from persistent leak and multisystem organ failure after esophagectomy, and care was eventually withdrawn.

Discussion

When compared to patients with coronary artery disease who did not undergo bridging, perioperative bridging with eptifibatide was not associated with increased risk of bleeding requiring transfusion or postoperative length of stay in patients with high-risk intra-coronary stents. While the proportion of MACE was similar between groups, composite cardiovascular complications were more likely in patients receiving eptifibatide bridging, possibly explained by differing baseline characteristics. From a bleeding standpoint, eptifibatide bridging appears safe in this population. One of our patients demonstrated the vulnerability to myocardial infarction in the DAPT-free window immediately after surgery, coinciding with the pro-thrombotic postoperative state. Though our study was underpowered to detect rare complications such as MACE, we found no major differences between the eptifibatide and control group in this outcome.

Patients undergoing PCI are routinely prescribed DAPT for the prevention of stent thrombosis, a serious condition associated with a threefold increase in mortality⁶. While DAPT is efficacious for the prevention of stent thrombosis and MACE, it increases bleeding risk⁹. Previous studies have indicated that perioperative morbidity and mortality may be as high as 45%¹⁰ and 20%¹¹, respectively, in the noncardiac surgical patients with recent PCI. Our overall complication rate was similar to prior investigations, though our mortality rate (7/99, 7.1%) was lower.

Perioperative management for patients on DAPT who require surgery may proceed down one of three paths: 1) continuation of DAPT throughout the perioperative period, which may increase bleeding risk, 2) thienopyridine cessation days prior to surgery with continuation of aspirin, which our institution abandoned in response to repeated perioperative myocardial infarctions despite aspirin, and 3) implementation of a perioperative “bridge” with a short-acting intravenous antiplatelet agent to balance the opposing risks of bleeding and cardiovascular events, as our institution does¹². While there are no definitive data favoring any approach, we found no increased risk of bleeding, transfusion, death, or MI in patients receiving perioperative bridging therapy with short-acting intravenous antiplatelet agents compared to less complex patients with coronary artery disease.

While we cannot demonstrate efficacy with our approach, other centers have also attempted to minimize risks by bridging patients with short acting antiplatelet agents^{13, 14}. Perioperative bridging with a short-acting intravenous antiplatelet agent may reduce cardiovascular complications while also minimizing the risk of perioperative bleeding¹⁵. While many prior studies of bridging have either exclusively¹³ or primarily involved cardiac surgery^{14, 16} patients, some have examined primarily noncardiac surgical patients¹⁷. To our

knowledge, this is the first investigation of perioperative bridging addressing thoracic surgery patients, who constitute a unique patient population due to high risk comorbidities, including prevalent coronary artery disease, and increased bleeding risk. In addition, these types of surgeries are not usually deferrable for the recommended duration of DAPT post-PCI/stenting.

There is a relative paucity of data to guide decision-making regarding anticoagulation and non-cardiac surgery. The 2014 American College of Cardiology/American Heart Association guidelines advise continuing DAPT for patients with recent DES (<4–6 weeks) who require urgent surgery as well as delaying surgery for at least 180 days (optimally 1 year) after DES¹⁸. However, delaying oncologic thoracic surgery is not appropriate, therefore such patients require an individualized approach to managing perioperative antiplatelet therapy. In addition, a significant number of patients receive “off label” DES (i.e. high risk location, bifurcating or small vessels), which carry a higher rate of stent thrombosis¹⁹ and also require individualized perioperative consideration.

Our study is limited in its conclusions due to the retrospective nature of this investigation, as well as the small sample size. In addition, patients in the eptifibatide group had more complex CAD, including a high rate of in-stent thrombosis, which may have predisposed them to postoperative cardiovascular complications. There was also bias introduced by imperfect matching, for example matching benign esophageal and miscellaneous procedures to wedge resections, as no identical procedures were performed in the control group. Given the database structure for control patients, we were unable to perform matching based upon propensity scores, which also limited our investigation. A post-hoc power calculation showed that we were underpowered to detect a difference in number of red cell units transfused, though the utility of post-hoc power calculations has been questioned previously²⁰. Though newer guidelines regarding DAPT have shortened the required duration of intensive anticoagulation, this cohort of patients was collected prior to these guidelines, and so reflects earlier, more conservative management. It is our hope that this exploratory investigation prompts further study of the bleeding risks associated with antiplatelet agent bridging in high-risk surgical populations.

At present, our work represents the largest investigation of perioperative eptifibatide bridging in thoracic surgery patients. In this study, we have demonstrated that perioperative eptifibatide bridging is not associated with increased risk of bleeding, or the composite outcome of myocardial infarction or perioperative death (MACE). While total hospital LOS was increased, postoperative LOS was not significantly different between groups, likely owing to the need for preadmission. We also detected a difference between groups in composite cardiovascular events, which were primarily postoperative atrial fibrillation. This may reflect a difference in baseline atrial fibrosis or perioperative triggers, including inflammation, autonomic tone, or postoperative fluid balance²¹. Future investigations in this area are necessary to clarify 1) which patients are at highest risk for perioperative stent thrombosis/myocardial ischemia, and thus benefit the most from bridging, 2) the role of platelet function assays in monitoring biological efficacy of bridging protocols, 3) whether temporary bridging with a GPIIb/IIIa inhibitor might induce paradoxical platelet activation,²² and 4) benefits versus risks of continuing anti-platelet therapy (ideally a short

acting intravenous drug such as cangrelor¹³ or tirofiban¹⁷) during the vulnerable postoperative course until longer-acting DAPT is re-established. Though costs were not evaluated as part of our study, a prior analysis showed an approximately \$2700/day cost of eptifibatide bridging²³. In the era of cost-containment and the Affordable Care Act, consideration of the cost-benefit ratio of such protocols will be increasingly important. In order to find routine use as a perioperative bridging agent, eptifibatide will demonstrate efficacy in reducing serious adverse events to match its cost and need for preadmission. Although future randomized controlled trials or larger multi-institutional studies are necessary to delineate the optimal management strategy for thoracic surgery patients with high-risk PCI, we believe that the eptifibatide bridging strategy outlined represents a rational method of balancing the opposing risks of myocardial ischemia and excessive perioperative bleeding.

Acknowledgments

Funding: This work was supported by departmental funds.

NHW is supported by a Foundation for Anesthesia Education and Research (FAER) Research Fellowship Grant. IJW supported by NIH R01HL121232-01.

Glossary of abbreviations

CAD	Coronary artery disease
LOS	Length of stay
MI	Myocardial infarction
PCI	Percutaneous coronary intervention
DAPT	Dual antiplatelet therapy
DES	Drug-eluting stent
MACE	Major adverse cardiac events
VATS	Video-assisted thoracoscopic surgery

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Figure 1. Breakdown of study population

Diagram depicting the management of antiplatelet drugs in the perioperative period.

Figure 2.
CONSORT diagram for study participants.

Figure 3. Proportion of patients in the eptifibatide (black) and control (grey) groups requiring red cell transfusion.

Table 1**Baseline Demographics and Surgical Characteristics**

Characteristic	Control (n=69)	Eptifibatide (n=30)	p-Value
Age, mean (SD)	67 (7.3)	65 (8.0)	0.31
Sex (male/female)	52 (75.4%)/17 (24.6%)	23 (76.7%)/7 (23.3%)	0.89
American Society of Anesthesiologists Score, median (range)	3 (2–4)	3 (3–3)	0.77
Weight (kg), mean (SD)	82.5 (20.7)	79.1 (15.5)	0.43
BMI, mean (SD)	28.0 (5.9)	26.4 (4.8)	0.23
Comorbidities			
Cerebrovascular disease, n (%)	8 (11.6%)	3 (10%)	1.00
Diabetes Mellitus, n (%)	15 (21.7%)	8 (26.7%)	0.59
Insulin-dependent Diabetes Mellitus, n (%)	2 (2.9%)	1 (3.3%)	1.00
Chronic Kidney Disease [*] , n (%)	13 (18.8%)	2 (6.7%)	0.14
Baseline Creatinine >2 mg/dL, n (%)	6 (8.7%)	0	0.17
Dialysis, n (%)	1 (1.5%)	0	1.0
Chronic steroids, n (%)	9 (13.0%)	2 (6.7%)	0.50
Hypertension, n (%)	51 (73.9%)	20 (66.7%)	0.46
Congestive Heart Failure, n (%)	18 (26.1%)	4 (13.3%)	0.16
History of Myocardial infarction, n (%)	23 (33.3%)	16 (53.3%)	0.06
History of Atrial fibrillation, n (%)	6 (8.7%)	2 (6.7%)	1.0
Peripheral Vascular Disease, n (%)	4 (5.8%)	7 (23.3%)	0.02
Chronic obstructive pulmonary disease, n (%)	27 (39.1%)	10 (33.3%)	0.58
History of deep venous thrombosis, n (%)	2 (2.9%)	2 (6.7%)	0.58
History of pulmonary embolism, n (%)	0	1 (3.3%)	0.30
Preoperative Medications			
Beta Blocker, n (%)	36 (52.2%)	17 (56.7%)	0.68
Calcium Channel Blocker, n (%)	14 (20.3%)	7 (23.3%)	0.73
Aspirin, n (%)	40 (58.0%)	25 (83.3%)	0.08
P2Y ₁₂ inhibitors, n (%)	11 (16.7%)	30 (100%)	<0.0001
Coronary Artery Disease, n (%)			
History of Stent, n (%)	16 (23.2%)	30 (100%)	<0.0001
Stent (Left anterior descending), n (%) [^]	5 (7.4%)	9 (30%)	NT
Stent (Diagonal artery), n (%) [^]	1 (1.5%)	1 (3.3%)	NT
Stent (Circumflex artery), n (%) [^]	1 (1.5%)	5 (16.7%)	NT
Stent (Obtuse marginal artery), n (%) [^]	0	2 (6.7%)	NT
Stent (Right coronary artery), n (%) [^]	5 (7.4%)	10 (33.3%)	NT
History of drug-eluting stents, n (%)	3 (4.3%)	22 (73.3%)	<0.0001
Previous in-stent thrombosis, n (%)	2 (2.9%)	3 (10%)	0.35

Characteristic	Control (n=69)	Eptifibatide (n=30)	p-Value
Stent < 1 year old, n (%)	5 (7.2%)	16 (53.3%)	0.0002
History of coronary artery bypass grafting	23 (33.3%)	6 (20%)	0.18
Baseline Hemoglobin (mg/dL), mean (SD)	13.1 (2.2)	11.9 (1.9)	0.007
Baseline Platelets (x10⁹/L), mean (SD)	236 (77)	247 (87)	0.53
Surgical Characteristics			
Video-assisted thoracoscopic surgery (VATS), n (%)	54 (78.3%)	23 (76.7%)	0.86
Esophagogastrectomy, n (%)	6 (8.7%)	3 (10%)	1.00
Wedge resection, n (%)	37 (53.6%)	7 (23.3%)	0.005
Lobe resection, n (%)	20 (29.0%)	10 (33.3%)	0.67
Pneumonectomy, n (%)	4 (5.8%)	1 (3.3%)	1.00
Lung volume reduction surgery, n (%)	1 (1.5%)	1 (3.3%)	0.52
Fundoplication, n (%)	0	2 (6.7%)	0.09
Drainage of pleural effusion, n (%)	0	2 (6.7%)	0.09
Other procedure, n (%) [#]	0	4 (13.3%)	0.007

* Chronic kidney disease defined as GFR < 90.

[^] Missing data for LAD stent in 12/30 (40%) of eptifibatide patients, 32/68 (47%) of control patients, Diagonal stent in 13/30 (43%) of eptifibatide patients, 33/68 (49%) of control patients, Circumflex stent in 12/30 (40%) of eptifibatide patients, 33/68 (49%) of control patients, OM stent in 13/30 (43%) of eptifibatide patients, 33/68 (49%) of control patients, and RCA stent in 12/30 (40%) of eptifibatide patients, 33/68 (49%) of control patients.

NT = not tested due to concordance (presence of CAD) or missing data (stent location).

[#] "Other procedure" included n=1 bronchoscopy/mediastinoscopy with aborted lobectomy due to diffuse disease, n=1 VATS hilar mass biopsy, n=1 VATS excision of a mediastinal tumor, and n=1 VATS sympathectomy and right upper lobe decortication.

Table 2

Bleeding complications and postoperative outcomes

Outcome	Control (n=69)	Eptifibatide(n=30)	p-value
Units of red blood cells transfused, mean (SD)	1.6 (4.2)	1.4 (2.5)	0.72
Units of plasma transfused, mean (SD)	0.3 (1.3)	0.1 (0.4)	0.93
Units of platelets transfused, mean (SD)	0.1 (0.7)	0	0.13
Units of cryoprecipitate transfused, mean (SD)	0	0	NT
Perioperative transfusion, n (%)	18 (26.1%)	9 (30%)	0.69
Required red blood cells	18 (26.1%)	9 (30%)	NT
Required plasma	4 (5.8%)	2 (6.7%)	NT
Required platelets	5 (7.3%)	0	NT
MACE, n (%)	7 (10.1%)	3 (10%)	1.00
Acute Myocardial Infarction, n (%)	2 (2.9%)	1 (3.3%)	NT
Perioperative Death, n (%)	5 (7.3%)	2 (6.7%)	NT
Total Length of Stay (days), mean (SD) *	7.9 (10.1)	8.7 (5.0)	0.0002
Postoperative Length of Stay (days), mean (SD) *	7.9 (10.1)	6.5 (5.1)	0.69
Chest tube duration (days), mean (SD)	3.8 (4.0)	4.4 (3.5)	0.57
Intraoperative blood loss (mL), mean (SD)	380 (305)	385.4 (483)	0.96
Postoperative complications, n (%)	24 (34.8%)	15 (50%)	0.15
Any Cardiovascular complication, n (%)	11 (15.9%)	11 (36.7%)	0.02
Atrial fibrillation, n (%)	9 (13.0%)	7 (23.3%)	0.24
Reoperation for bleeding, n (%)	1 (1.4%)	0	NT
Reoperation for decortication, n (%)	3 (4.3%)	0	NT
Reintubation, n (%)	8 (11.6%)	2 (6.7%)	0.72
New renal failure, n (%)	3 (4.4%)	2 (6.7%)	NT
Confusion, n (%)	3 (4.4%)	0	NT

* p value displayed is from Student's T test of log-transformed data, which demonstrated sufficient normality after transformation (Kolmogorov-Smirnov p=0.153 for LOS, p>0.150 for postoperative LOS).

NT = not tested due to low incidence or tested previously (requirement for red blood cells, plasma, platelets)