Evaluation of a Standardized Risk-Based Venous Thromboembolism Prophylaxis Protocol in the Setting of Thyroid and Parathyroid Surgery

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BACKGROUND: An elevated odds ratio for venous thromboembolism (VTE) prompted development of a Caprini risk assessment and risk-based prophylaxis protocol for all general surgery patients. This system includes pre- and postoperative prophylactic heparin as well as extended courses of low molecular weight heparin for high-risk patients. This study evaluated the safety of this chemoprophylaxis program in thyroid and parathyroid surgery.

STUDY DESIGN: A retrospective review was conducted of all general surgery patients undergoing thyroid or parathyroid operations after implementation of the Caprini prophylaxis protocol. Descriptive statistics were performed to evaluate bleeding complications, risk score categories, and chemoprophylaxis.

RESULTS: Of 1,012 consecutive patients, 72% were determined to be at low/moderate risk for VTE, 26% were high risk, and 2% were highest risk. Only 29% of eligible high/highest-risk patients actually received extended prophylaxis after discharge. Fifteen patients (1.5%) developed wound hematomas that required evacuations, 12 of them within 24 hours of the index operation. Among patients who developed bleeding complications, 5 (33%) had Caprini scores indicating low/moderate-risk for VTE, and 10 (67%) were in the high/highest-risk categories. Only 1 patient developed a delayed hematoma that required a return to the hospital for evacuation. One patient developed a VTE complication.

CONCLUSIONS: Although the incidence of VTE is quite low for patients undergoing thyroid and parathyroid operations, the Caprini prophylaxis protocol identifies a subset of high-risk patients who may benefit from extended VTE prophylaxis without the likelihood of added harm. Conversely, Caprini scores might also select low-risk patients who require no chemoprophylaxis, possibly reducing risks of hemorrhage. (J Am Coll Surg 2017;224:1029−1035. © 2017 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

Venous thromboembolism (VTE) events, including deep vein thrombosis (DVT) and pulmonary embolism, are a significant cause of postoperative morbidity and mortality. Symptomatic VTE occurs in 0.96% to 3.1% of general surgery patients, with many of these events occurring after discharge.[1,2] For some patients, DVTs and pulmonary emboli may be found incidentally or cause a brief symptomatic episode. For others, VTE can be more serious, with development of chronic venous insufficiency after a DVT, or pulmonary hypertension and even sudden death after a pulmonary embolism.[3] Given the high morbidity and mortality associated with VTE, there has been an increased focus on preventing development of these complications.

The many known risk factors for VTE have allowed for risk stratification to determine which patients are at elevated risk. The Caprini VTE risk assessment has been validated among general surgery patients and patients in other surgical specialties, and is able to correctly identify those at low, moderate, and high risk for VTE.[4-9] Protocols that incorporate mandatory risk stratification

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Abbreviations and Acronyms

DVT = deep vein thrombosis
EMR = electronic medical record
LMWH = low molecular weight heparin
VTE = venous thromboembolism

scores for all surgical patients and risk-appropriate VTE prophylaxis have reduced the incidence of VTE,[4] including at our own institution.[10] Despite strong evidence to support the use of VTE prophylaxis in surgical patients, more than half of patients may not receive appropriate prophylaxis.[11] Risk of bleeding is often cited as a reason patients are not prescribed sufficient chemical VTE prophylaxis.[12]

Although VTE prophylaxis has become relatively routine in other surgical patients, it remains controversial for patients undergoing thyroid and parathyroid operations. Studies suggest that the overall risk for VTE after thyroid and parathyroid surgery is quite low, ranging from 0.02% to 0.2%.[13-16] Additionally, a postoperative hemorrhage may cause acute airway compromise. Considering an historical rate of postoperative bleeding that results in 0.8% to 1.8% of patients returning to the operating room, many thyroid surgeons presume that the risk of bleeding outweighs the benefits of VTE prophylaxis.[1] Since the inception of a standardized VTE prevention program at Boston Medical Center in 2011,[10] all general surgery patients, including those undergoing thyroid and parathyroid operations, have been assessed for VTE risk using the Caprini risk assessment model. This study evaluates the safety of this VTE chemoprophylaxis program, including extended courses beyond discharge, in thyroid and parathyroid surgery.

METHODS

A standardized VTE prophylaxis program, based on the Caprini model, was implemented at Boston Medical Center in February 2011.[10] The Caprini score is a validated VTE risk assessment composed of more than 30 factors, each of which is assigned a different numerical value ranging from 1 to 5, depending on relative risk. The final score is the cumulative number of points, with greater scores associated with an increased likelihood of developing a VTE complication. Our protocol includes mandatory calculation of Caprini scores for every patient, as prompted by the electronic medical record (EMR). Risk-based prophylaxis is recommended by the EMR in the general surgery order sets according to the calculated Caprini score. For patients with low VTE risk (Caprini scores 0 to 2), either mechanical prophylaxis (eg intermittent pneumatic compression devices) with early mobilization or chemical prophylaxis is recommended during hospitalization. Those at moderate risk (scores 3 to 4) are prescribed subcutaneous injections of unfractionated heparin or low molecular weight heparin (LMWH) at prophylactic dosages, as well as mechanical prophylaxis, while inpatients. In addition to inpatient mechanical and chemical prophylaxis, those at high (scores 5 to 8) and highest (scores $\geq$9) risk are prescribed extended chemical prophylaxis with LMWH for as long as 7 to 10 days and 30 days, respectively. Due to its shorter half-life, unfractionated heparin is administered to all patients before operations and then every 8 hours during the early postoperative period. The regimen is changed to once-daily LMWH on discharge if extended prophylaxis is advised, as long as no immediate bleeding complications develop. Surgeons naturally retain the discretion to refuse, extend, or otherwise modify the protocol's chemoprophylaxis recommendations at all risk levels, typically declining extended courses of prophylactic anticoagulation when the likelihood and hazards of postoperative bleeding seemingly exceed the chances of VTE and its consequences. The senior authors (GD and DM) prospectively decided to include all of their patients undergoing thyroidectomies and parathyroidectomies in the Caprini protocol due to their leadership roles and the desire to promote compliance with the overall program in the department of surgery.

A retrospective review was conducted of all general surgery patients undergoing thyroid or parathyroid operations from February 2011 through February 2016. This series includes patients who had any thyroid or parathyroid operation (ie total thyroidectomy, unilateral thyroid lobectomy, and parathyroidectomy, with or without central lymph node dissection), with the exception of those performed concomitantly with other major operations (Table 1). Individual EMRs were queried for Caprini score, age, sex, chemical prophylaxis prescribed, VTE complications, or bleeding episodes within 30 days of the initial operation. Details of bleeding complications were reviewed, including timing of the event, identifiable causes of bleeding, and operative findings. Descriptive statistics were performed to evaluate bleeding complications, risk score categories, and chemoprophylaxis. This study was approved by the Boston University IRB.

RESULTS

Of the 1,012 consecutive patients included in this series, 72.4% were determined to be at low to moderate risk for