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# Case cohort study of risk factors for post-thyroidectomy hemorrhage



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Bleed;  
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## Abstract

**BACKGROUND:** Post-thyroidectomy hemorrhage is a potentially life-threatening complication of thyroid surgery. The goal of our study was to determine potential risk factors for development of post-thyroidectomy hemorrhage.

**METHODS:** A retrospective case cohort study of patients with post-thyroidectomy hemorrhage between December 2008 and August 2014 was performed. This group of patients was compared with a stratified randomized control group, and several parameters were assessed for association with post-thyroidectomy hemorrhage.

**RESULTS:** Sixteen patients were identified in this time period as developing post-thyroidectomy hemorrhage requiring reoperation. Postoperative hypertension, vomiting and/or straining, longer operative times, and extent of surgical dissection were found to be statistically significant risk factors. Postoperative hypertension was found to be the most significant risk factor, resulting in a 20.3 times increased likelihood of developing post-thyroidectomy hemorrhage.

**CONCLUSIONS:** A number of risk factors for post-thyroidectomy hemorrhage were identified. The most significant was postoperative hypertension. Early control of modifiable risk factors could improve patient outcomes and satisfaction.

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The total number of thyroid surgeries performed each year has steadily increased over time. It has increased from 66,864 in 1996 to 97,231 in 2006 and to 130,216 in 2011. This trend mimics the steady increase in the incidence of thyroid cancer. In 1975, the estimated incidence of thyroid

cancer was 4.8 per 100,000 people. This increased to 7.6 per 100,000 in the year 2000, and nearly doubled by 2011 to 14.7 per 100,000 people.<sup>1,2</sup> A number of significant potential complications exist. These include nerve injury, vocal cord palsy, infection, hypoparathyroidism, and hemorrhage. Postoperative bleeding has a varying incidence between approximately .4% and 4%.<sup>3-6</sup> A number of risk factors have been linked to the development of postoperative hemorrhage, including patient age, gender, tumor size, extent of lymphatic dissection, the presence of Grave's disease, and hypertension defined as systolic blood pressure (SBP) greater than 150 mm Hg.<sup>6-10</sup> The goal of our study was to better delineate causes of post-thyroidectomy

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bleeding in our patient population to reduce the incidence of potentially preventable catastrophic postoperative complications and improve patient outcomes.

## Methods

A retrospective case cohort study of all patients with post-thyroidectomy hemorrhage between December 2008 and August 2014 was performed. During this study period, 16 patients were identified with post-thyroidectomy bleeding requiring reoperation. The hemorrhage group was compared with a stratified randomized sample of 32 patients that did not develop postoperative hemorrhage. Patients in this group were randomly selected to obtain a 2:1 ratio of nonhemorrhage to hemorrhage and were controlled for the number of hemorrhage patients experienced by each surgeon involved. Five surgeons were involved in the care of our patients, and randomization was done to include only patients of the 5 surgeons previously identified. Descriptive analysis as well as Student's *t*-test and chi-square analysis with Fisher's exact test were performed to analyze the data. *P* value less than .05 was considered statistically significant. Several parameters were analyzed for potential association with postoperative hemorrhage. Surgeon specific rates were also analyzed. The study protocol was approved by our hospital's Institutional Review Board.

## Results

For the time period of our study, 682 thyroid surgeries were performed. Overall 16 of 682 of these patients developed postoperative hemorrhage requiring reoperation, an incidence of 2.3%.

Within the hemorrhage group, median age was 54.5 (range 28 to 77). Overall 14 of 16 were female, and 2 of 16 were male. Overall 8 of 16 were Caucasian, and 8 of 16 were African American. The most common indication for surgery was goiter, and the most common operation performed was total thyroidectomy. A total of 9 of 16 underwent total thyroidectomy, 5 of 16 underwent thyroid lobectomy, and 2 of 16 underwent total thyroidectomy with parathyroidectomy. Within the control group, median age was 52 (range 37 to 75). Overall 27 of 32 were female, and 5 of 32 were male. Overall 21 of 32 were Caucasian, and 11 of 32 were African American. A total of 27 of 32 underwent total thyroidectomy, 3 of 32 underwent thyroid lobectomy, and 2 of 32 underwent total thyroidectomy with parathyroidectomy.

Of the 5 surgeons involved with our patients' care, 2 of them shared most hemorrhage requiring reoperation, having 7 of 16 (44%) and 6 of 16 (38%) patients, respectively. During the time period of our study, surgeon 1 had a total of 162 cases and an incidence of hemorrhage of 6 of 162 (3.7%). Surgeon 2 had a total of 355 cases and incidence of 7 of 355 (2%).

Median operative time was 149.5 minutes (range 50 to 240). The median time interval until development of symptoms was 205 minutes (range 30 to 1320). The most common sites of bleeding found at reoperation were an actively bleeding vessel (5 of 16) or generalized oozing (5 of 16). Postoperative hypertension, defined as SBP greater than 150 mm Hg, was identified in 13 of 16 patients. Swelling was the most common sign and/or symptom present, found in 13 of 16 patients. Overall 2/16 patients developed stridor and required opening of the incision at the bedside.

Several variables were not found to be statistically significant risk factors for post-thyroidectomy hemorrhage (Table 1). These include the presence of an autoimmune disorder, hemostatic technique used (suture ligation vs harmonic device), use of a drainage device, lymph node dissection, and the use of antiplatelet therapy. Monopolar cautery was used in both hemorrhage and control groups for control of smaller points of bleeding; however, suture ligation and harmonic device were used for larger vessel ligation.

However, some key variables were noted to show significant association with postoperative bleeding (Table 1). Longer ( $152 \pm 51$  min) vs shorter ( $115 \pm 48$  min) operative times ( $P = .015$ ), substernal vs local neck dissection only ( $P = .044$ ), postoperative vomiting and/or straining ( $P = .032$ ), and postoperative hypertension (SBP >150 mm Hg;  $P < .0005$ ) were all found to be statistically significant variables for predicting postoperative hemorrhage. Stepwise logistic regression analysis was performed of the data, which demonstrated that those with a postoperative SBP greater than 150 mm Hg were 20.3 times more likely to develop post-thyroidectomy hemorrhage compared with those that were normotensive.

## Conclusions

Several potential risk factors for post-thyroidectomy bleeding were analyzed. The parameter with the greatest

**Table 1** Risk factors for post-thyroidectomy hemorrhage

Variable	Rate	<i>P</i> value
Hypertension (SBP>150 mm Hg)	13/16	<.0005
Substernal vs local neck dissection only	6/16	.044
Length of procedure	149.5 min	.015
Longer ( $152 \pm 51$ min) vs shorter ( $115 \pm 48$ min)	(median)	
Vomiting/straining	3/16	.032
Lymph node dissection	0/16	.542
Use of drainage device	8/16	1.00
Autoimmune disease	2/16	.159
Antiplatelet therapy	1/16	.333
Harmonic device	5/16	.542

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