

The Effects of Hypothyroidism on Perioperative Complications and Hospital Length of Stay in Patients Undergoing Major Spine Surgery

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Introduction

The prevalence of hypothyroidism in the United States is between 1 to 4%. It is associated with a number of systemic changes such as hypertension, cardiovascular disorders, osteoporosis, peripheral neuropathy, muscular weakness and eventually increase in mortality. To date there is limited data that describes the impact of hypothyroidism on perioperative morbidity in patients undergoing major spine surgery.

Methods

We performed a retrospective analysis of The Nationwide Inpatient Sample between 2004-2014. Patients who had an International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) procedure code indicating a spinal surgery (81.0x, 81.62-64, 84.8x, 03.0x, and 80.5x) were included. Patients in this cohort who had an ICD-9-CM diagnosis code indicating hypothyroidism (244.x) were compared to patients who did not.

Defined primary outcome measures were discharge disposition, length of stay (LOS), hospitalization cost, and short-term post-surgical complications [neurological, respiratory, cardiac, gastro-intestinal, wound complication and infections, venous thromboembolism, and acute-renal failure (ARF)]. Multivariable regression techniques were used to explore the association of hypothyroidism on short-term outcomes by adjusting for patient demographics, clinical and hospital characteristics.

Results

A total of 6,023,328 patients underwent major spine surgery from 2004-2014 for which 534,792 (8.9%) had a diagnosis of hypothyroidism. Hypothyroid patients had statistically significant increased odds of developing neurological, cardiac, respiratory, wound and thromboembolic complications when compared to their euthyroid counterpart. In addition hypothyroid patients had a longer median length of stay (3 days) in the hospital and they were less likely to be discharged home (68.5 vs. 79.5%).

Table 1: Characteristics of patients undergoing major lumbar spine surgery in the United States [2004-2014]

Characteristics	Euthyroid n = 5476261	Hypothyroid n = 534792	Significance (P value) Euthyroid to Hypothyroid
Demographics			
Mean age_±SD (in years)	54.27 (16.11)	62.33 (13.02)	<.001
Female gender, %	48.7	78.6	<.001

Table 2: Comorbidities in patients undergoing major spine surgery

Comorbidities %	Euthyroid n = 5476261	Hypothyroid n = 534792	Significance (*P value) Euthyroid to Hypothyroid
Stroke	0.4	0.5	<.001
CAD	8.8	11.3	<.001
COPD	5.5	6.7	<.001
CKD	1.9	3.5	<.001
Obese	30.5	14.9	<.001
ETOH	0.6	0.3	<.001
Coagulopathy	0.3	0.3	0.001
Heart Failure	1.5	2.4	<.001
HTN	42.7	56.6	<.001
DM	15.4	21.7	<.001
PVD	1.5	2.1	<.001
Seizures	1.5	1.7	<.001
Neurological Deficit	0	0	0.038
Osteomyelitis	2.5	6.4	<.001
HLD	22.2	36.3	<.001
Smoker	17.5	10.8	<.001
At least one comorbidity	67	81.7	<.001

*statistical significance = p < .001

Comorbidities - CAD = Coronary artery disease, COPD = Chronic Obstructive Pulmonary Disease, CKD = Chronic Kidney Disease, ETOH = Alcoholism, HTN = Hypertension, DM = Diabetes Mellitus Type 2, PVD = Peripheral Vascular Disease, HLD = Hyperlipidemia.

Table 3: Clinical outcomes and complications in patients with hypothyroidism in relation to euthyroidism undergoing major spine surgery

Outcome / complication	Euthyroid n = 5476261	Hypothyroid n = 534792	Significance (*P value) Euthyroid to Hypothyroid
Discharge Disposition %			
Discharge to home	79.6	68.5	<.001
Transfer to short term care facility	0.4	0.5	<.001
Transfer to other facility	9.9	17.5	<.001
Transfer to home care	9.9	13.4	<.001
Discharged against medical advice	0.1	0	<.001
Died	0.1	0.1	<.001
Discharged alive to unknown destination	0	0	<.001
Complications %			
Neurologic	1.1	1.3	<.001
Respiratory	2.3	2.5	<.001
Cardiac	0.6	0.6	<.001
Hematology	10.1	15	<.001
Gastrointestinal	0.8	0.8	0.019
Genitourinary	1.5	1.8	<.001
Pulmonary Embolism	0.3	0.4	0.003
Wound	1.7	1.8	<.001
Hardware	3.5	3.9	<.001
Durotomy	1.4	1.9	<.001
Any adverse event (one or more), %	18.5	24	<.001
Length of Stay			
Days (mean ± SD)	3.05 (8.95)	3.27 (20.6)	<.001
Median	2.00	3.00	<.001
Interquartile Range	1-4	1-4	

*statistical significance = p < .001

Table 4: Multivariable models demonstrating the association of hypothyroidism (relative to euthyroidism) with outcomes in patients undergoing major spinal surgery

Outcomes	Odds Ratio	95% CI		*P value
		Lower	Upper	
Neurologic	1.113	1.083	1.142	<.001
Respiratory	1.067	1.046	1.089	<.001
Cardiac	1.237	1.191	1.284	<.001
Hematology	0.943	0.931	0.955	<.001
Gastrointestinal	1.113	1.076	1.15	<.001
Genitourinary	1.07	1.052	1.104	<.001
Pulmonary Embolism	1.252	1.193	1.314	<.001
Wound	1.065	1.042	1.09	<.001
Hardware	0.981	0.965	0.997	0.023
Durotomy	1.007	0.985	1.03	0.539
Any adverse event (one or more), %	1.096	1.088	1.105	<.001

*statistical significance = p < .001

Discussion

Hypothyroidism was associated with increased risk of developing neurological, respiratory, cardiac, genitourinary, gastrointestinal, wound and thromboembolic complications.

In a similar fashion Diabetes Mellitus has been identified as a risk factor for increasing respiratory, cardiac and genitourinary complications in spine surgery. The most significant complications that were increased in hypothyroidism were cardiac which includes acute myocardial infarction (OR 1.237, 95% CI: 1.191, 1.284) and pulmonary embolism (OR 1.252, 95% CI: 1.193, 1.314). This may, in part, be explained by the different scientific evidence of endothelial dysfunction, increased risk of developing heart failure and cardiac arrhythmias in patients with hypothyroidism.

Walid et al in 2010 demonstrated that elevated HbA1c and hypothyroidism were associated with an increase in length of hospital stay and was an additive on overall healthcare costs. In our study the median length of stay was 1 day longer in the hypothyroid group (p value <.001). The mean length of stay was increased by .22 days in the hypothyroid group but the standard deviation was 9 versus 21 days in euthyroid and hypothyroid groups, respectively.

Conclusions

Hypothyroid patients undergoing major spine surgery are at increased risk of perioperative complications, have an increased length of stay and were less likely to be discharged home. Thus, tighter control of hypothyroidism prior to elective spine surgery may prevent unnecessary perioperative complications and decrease hospital length of stay.

References

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