

Laryngectomy with and without thyroidectomy: Differences in post-operative hypocalcemia and management

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BACKGROUND

Hypocalcemia is a well-studied risk of thyroid surgery. Monitoring and treatment protocols to identify and treat symptomatic patients are frequently published and reviewed. Total laryngectomy (TL), often paired with thyroidectomy, also poses significant risk of parathyroid dysfunction; however, surveillance routines are not as frequently discussed. While the indications for thyroidectomy and laryngectomy widely vary, the procedures are highly similar in terms of neck and parathyroid dissection.

This objective of this study is to identify trends in hypocalcemia monitoring, treatment, and long-term sequelae between these patient populations.

METHODS

Retrospective review of patients who underwent TL and hemi(HT)/total(TT) thyroidectomy at regional tertiary care centers in Louisiana from 2016-2019. Demographic and tumor specific information was gathered. Operative notes were examined in detail for information regarding parathyroid identification and management. Post-operative and post-discharge calcium, parathyroid hormone (PTH) values were recorded.

Table 1. Patient demographics

	All TL	TL alone	TL+HT	TL+TT	All T	HT	TT
Total, n	101	23	46	32	319	169	150
Male, n(%)	81(80)	17(74)	36(78)	28(88)	86(27)	44(26)	44(29)
Mean Age, y(SD)	60(9.5)	58(10.9)	61(8.9)	60(9.4)	49(14.6)	51(14.1)	48(15)
Mean BMI, kg/m ² (SD)	23(5.7)	24(6.6)	22(5.5)	23(5.5)	33(11.1)	33(8.7)	34(13.4)
Indication for surgery							
Early stage T1-T2, n(%)	16(16)	5(22)	7(15)	4(13)			
Advanced stage T3-T4, n(%)	76(75)	14(61)	36(78)	26(81)			
Thyroid Malignancy					117(37)	61(36)	56(37)
Benign Thyroid Pathology					202(63)	108(62)	94(63)
Surgical variables							
Central Neck Dissection	40(40)	4(17)	16(35)	20(63)	54(17)	7(4.1)	47(31)
Lateral Neck Dissection	87(86)	19(83)	38(83)	30(94)	18(11)	1(0.6)	17(11)
PT re-implanted intra-operatively	7 (6.9)	0(0)	3(6.5)	4(13)	18(5.6)	7(4.1)	11(7.3)
PT found on final path	24(24)	0(0)	10(9.9)	14(44)	85(27)	39(23)	46(31)

(PT = parathyroid, TL = total laryngectomy, TT = total thyroidectomy, HT = hemithyroidectomy, T = thyroidectomy)

RESULTS

Total laryngectomy (TL) with total thyroidectomy (TT) versus total thyroidectomy alone

- TL + TT demonstrated increased odds of POH and HPTH compared to TT alone (OR 10.7, OR 16.5, p<0.001, respectively).
- Odds of requiring long-term calcium supplementation was 8 times higher in TL + TT compared to TL alone (p=0.002), and 5.3 times as high in TL + TT compared to TL + HT (p=0.001).

TL with hemithyroidectomy (HT) versus hemithyroidectomy alone

- TL + HT demonstrated increased odds of HPTH (OR 8, p<0.001) without resultant statistically significant POH (p=0.19) compared to HT alone.
- Odds of requiring long-term calcium supplementation were not significantly higher in patients undergoing TL + HT as compared to TL alone (p=0.53).

TL with any thyroidectomy versus thyroidectomy alone

- TL with HT or TT demonstrated increased odds of POH and HPTH (OR 4.4 p=0.009, and OR 4.5 p=0.05) compared to HT or TT alone.

Total thyroidectomy versus hemithyroidectomy

- Patients undergoing TT demonstrated increased odds of POH and HPTH (OR 2.3, OR 4.3, p<0.00)1 respectively when compared to HT.

No other variables were significantly associated with development of POH or HPTH.

Table 2. Rates of post-operative hypocalcemia, hypoparathyroidism, and long-term calcium supplementation by surgery type.

	Post-op hypocalcemia n(%)	Post-op low PTH n(%)	Long-term Calcium Supplementation n(%)
TL alone	7 (30.4)	3 (33.3)	4 (17.4)
TL + HT	18 (39.1)	13 (48.1)	12 (26.1)
TL + TT	28 (87.5)	25 (89.3)	22 (68.8)
TL + any T	46 (59.0)	38 (69.1)	34 (43.6)
HT	48 (30.2)	14 (10.4)	29 (17.2)
TT	72 (48.3)	49 (33.6)	34 (22.7)

(PTH = parathyroid hormone, TL = total laryngectomy, HT = hemithyroidectomy, TT = total thyroidectomy, T = thyroidectomy)

DISCUSSION

- Temporary or permanent loss of function of the parathyroid glands leads to hypocalcemia. Early symptoms include paresthesias, irritability, and cramps. At critical levels, it can progress to severe symptoms including cardiac arrhythmia and seizure¹⁻³.
- Given small size, location, and fine vascular supply, these glands are at risk of removal or dysfunction secondary to vascular compromise during neck surgery, such as thyroidectomy or TL⁴⁻⁶
- Our data demonstrates significantly elevated rates of POH and HPTH with the addition of thyroidectomy to TL.
- Rates were worse in patients undergoing bilateral thyroid procedures versus unilateral especially when done with central neck dissection, as has been corroborated in prior literature^{6,7-9}.

Limitations

- Retrospective; limits ability to uniformly surveil and screen patients for POH and HPTH
- Long term follow-up data was available on nearly all patients, but post-operative screening protocols for POH and HPTH varied significantly between each cohorts

CONCLUSION

Post-operative hypocalcemia in total laryngectomy patients is a significant risk and addition of thyroidectomy to laryngectomy further increases the risk of long-term sequela of parathyroid injury.

Given the delicate co-morbid condition of many laryngectomy patients, attention to thoughtful parathyroid preservation during laryngectomy is of paramount importance to reduce post-operative morbidity. Standardized protocols for post-operative calcium surveillance and supplementation are necessary to further identify patients affected by the extent of their oncologic surgery.

REFERENCES

1. Johnson JT, Rosen CA, Bailey BJ. *Bailey's head and neck surgery--otolaryngology*. 5th ed. Philadelphia: Wolters Kluwer Health /Lippincott Williams & Wilkins; 2014.
2. Cooper MS, Gittoes NJ. Diagnosis and management of hypocalcaemia. *BMJ*. 2008;336(7656):1298-1302.
3. Clarke BL. Epidemiology and Complications of Hypoparathyroidism. *Endocrinol Metab Clin North Am*. 2018;47(4):771-782.
4. Kakava K, Tournis S, Papadakis G, et al. Postsurgical Hypoparathyroidism: A Systematic Review. *In Vivo*. 2016;30(3):171-179.
5. Campos NS, Cardoso LP, Tanios RT, et al. Risk factors for incidental parathyroidectomy during thyroidectomy. *Braz J Otorhinolaryngol*. 2012;78(1):57-61.
6. Orloff LA, Wiseman SM, Bernet VJ, et al. American Thyroid Association Statement on Postoperative Hypoparathyroidism: Diagnosis, Prevention, and Management in Adults. *Thyroid*. 2018;28(7):830-841.
7. Thomusch O, Machens A, Sekulla C, Ukkat J, Brauckhoff M, Dralle H. The impact of surgical technique on postoperative hypoparathyroidism in bilateral thyroid surgery: a multivariate analysis of 5846 consecutive patients. *Surgery*. 2003;133(2):180-185.
8. Bai B, Chen Z, Chen W. Risk factors and outcomes of incidental parathyroidectomy in thyroidectomy: A systematic review and meta-analysis. *PLoS One*. 2018;13(11):e0207088.
9. Alraddadi T, Aldahri S, Almayouf M, et al. Risk Factors of Incidental Parathyroidectomy in Thyroid Surgery. *Cureus*. 2019;11(12):e6517.