

# A study of risk factors for loss of signal during neuromonitoring of the recurrent laryngeal nerve in thyroid surgery

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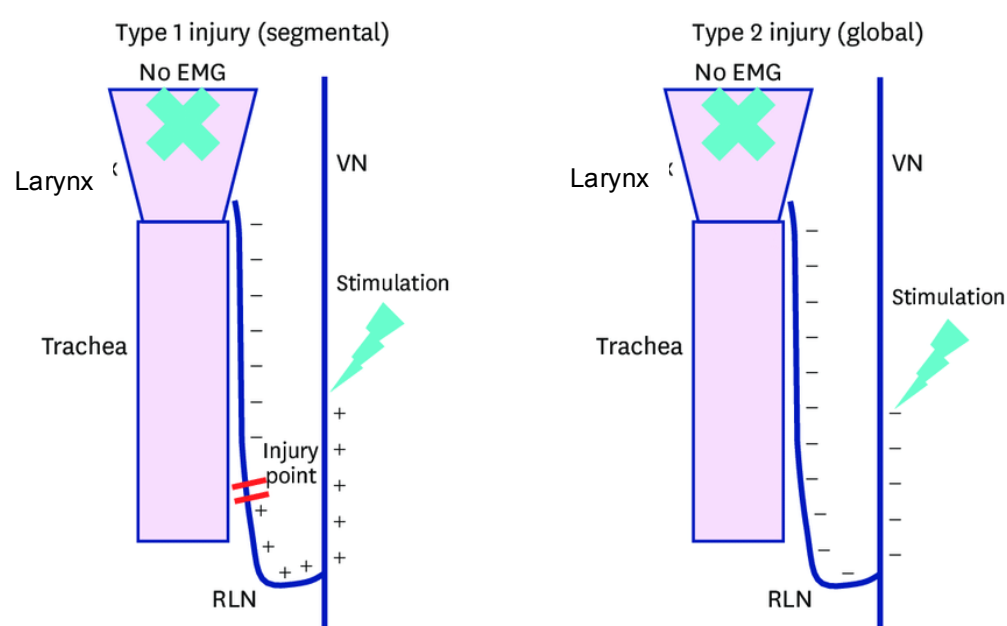
## Conclusion

- LOS occurs in 2.7% of nerves at risk
- There is evidence of an association between LOS and toxic lesion.
- Type II LOS is associated with reduced time to recovery.
- Female sex and older age is associated with longer time to recovery.
- Our results contribute to emerging evidence that can help guide surgeons on expected recovery time.

## Introduction

Injuries of the recurrent laryngeal nerve (RLN) during thyroidectomy can lead to major morbidity. Permanent RLN injury is rare, however temporary neuropraxia and loss of signal (LOS) during intraoperative neuromonitoring (IONM) are seen more frequently.

This study aimed to identify factors associated with type I (segmental) and II (global) LOS of the RLN during thyroid surgery and to analyse time to recovery of vocal cord function.



**Figure 1.** Type 1 and type 2 injuries. EMG = electromyogram; RLN = recurrent laryngeal nerve; VN = vagal nerve. Adapted from Kim et al, 2017. Medico-Legal Issues of Intraoperative Neuromonitoring in Thyroid Surgery. Journal of Endocrine Surgery.

## Materials & Methods

- Observational retrospective cohort study
- Patient group: All patients who underwent hemi- or total thyroidectomy at RNSH in the period January 2015 – Dec 2021
- Exclusion criteria: age at operation <18yo, pre-op vocal cord palsy, RLN was sacrificed due to malignant invasion.
- Statistical analyses: Descriptive statistics assessed using Mann-Whitney U Tests and Pearsons Chi-squared analyses. Univariable and multivariable logistic and linear regression analyses to determine factors associated with outcomes of LOS and time to recovery.

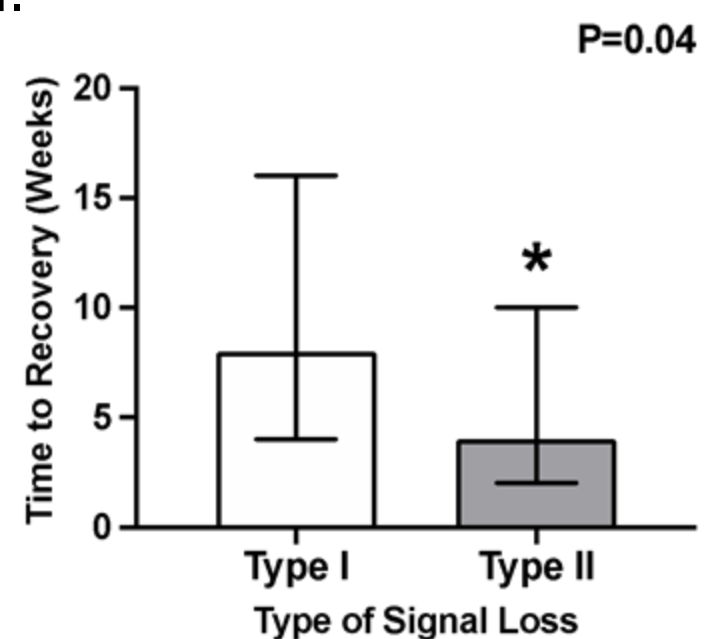
## Results

Of a total of 3806 patients that underwent total or hemithyroidectomy, 161 patients had LOS, with a median age of 59 years old. There was no difference observed between men and women.

RLN LOS occurred in 167 (2.7%) of 5983 nerves at risk during surgery. The rate of Type I and Type II LOS per nerve at risk was 1.4% and 1.3% respectively. There were 3 cases of permanent RLN injury (0.05%). Most patients who had LOS had undergone a thyroid procedure for an indication of malignancy (39.3%) or compression (34.2%;  $P < 0.05$ ).

Regarding factors associated with LOS, indication of toxic nodule was associated with 96% increased odds of LOS independent of age and sex compared with an indication of malignancy ( $P < 0.001$ ). We did not find any direct predictable association between LOS and indication or tumour size.

Time to recovery was significantly reduced for those with a Type II LOS (median 4 weeks) compared to Type I LOS (median 8 weeks;  $p = 0.04$ ). On the other hand, female sex and increasing age were independently associated with a longer duration to return of vocal cord function.



**Figure 2.** Time to recovery in weeks following Types I and II loss of recurrent laryngeal nerve signal. Data are presented as median (Q1, Q3) weeks to recovery following loss of signal. \* Denotes a difference between Type I and Type II at  $P < 0.05$ . P-value generated using Wilcoxon rank-sum test of difference.

## Discussion

- Key finding is that time to recovery is significantly reduced for Type II vs Type I LOS. This is supported by studies by the International Neural Monitoring Study Group which found Type I LOS entails more severe nerve damage than Type II, taking longer to recovery.
- Factors associated with LOS:
  - Toxic nodules are at increased risk compared to malignant nodules and other indications – unclear why this is the case.
  - We did not find an association with retrosternal goitre or malignancy.