# Effect of Anesthesia on Intraoperative Parathyroid Hormone Assay in Thyroid and Parathyroid Surgery

David S. H. Kim, MD, Annabel E. Barber, MD, Robert C. Wang MD

Division of Otolaryngology-Head and Neck Surgery, University of Nevada School of Medicine, Las Vegas, NV

## Introduction

- Intraoperative parathyroid hormone (IOPTH) assay is frequently used as a predictive marker for postoperative hypocalcemia in total thyroidectomy and as an outcome measure in parathyroidectomy for primary hyperparathyroidism.
- Parathyroid hormone is a principal regulator of serum calcium and has a short half-life of 1-4 minutes.
- Studies have shown that various anesthetic techniques can cause an increase in PTH as a result of stress response mediated via alpha-adrenergic stimulation. The induction of general anesthesia with laryngoscopy and endotracheal intubation has been shown to increase catecholamine secretion significantly, causing an immediate surge in PTH. However, the implication of these observations is not well understood in head and neck endocrine surgery.
- The aims of this study were to investigate the effect of anesthesia on IOPTH in total thyroidectomy and parathyroidectomy and understand the implications of the relationship in using IOPTH as a surgical outcome parameter.

## Methods

- Study: prospective cohort study with chart review
- 52 patients undergoing total or completion thyroidectomy for benign and malignant pathologies and 27 patients undergoing parathyroidectomy for primary hyperparathyroidism between November 2014 and January 2016 at a tertiary academic center and a community hospital were enrolled.
- In the thyroidectomy group, PTH was measure at the following time points: pre-anesthesia (immediately prior to surgery), pre-incision (following anesthesia induction but prior to skin incision), post excision (20 min following complete excision of a gland) and post operative.
- In the parathyroidectomy group, PTH was measured at pre-anesthesia, pre-incision, pre-excision and post-excision (5 and 10 min).
- Normal intact PTH was defined as 11.1-79.5 pg/ml

| | Total Thyroidectomy | Parathyroidectomy | P value |
|---|---|---|---|
| Pre-anesthesia PTH (pg/ml) | 52.1 ± 17.2 | 158 ± 141 | $p<0.05$ |
| Pre-incision PTH (pg/ml) | 132 ± 39.6 | 254 ± 231 | $p<0.05$ |
| Mean Absolute PTH Increase (pg/ml) | 79.3 ± 45.7 (range: 24-171) | 83.2 ± 108 (range: 0.5-406) | $p=0.11$ |
| Mean Percentage Increase (%) | 148 ± 90.7 (range: 42-494) | 32.7 ± 34.4 (range: 1-129) | $p<0.05$ |

Table 1. Comparison of pre-anesthesia and pre-incision PTH between total thyroidectomy and parathyroidectomy groups

## Results

- IOPTH increased globally following anesthesia induction and endotracheal intubation in both groups.
- In the total and completion thyroidectomy group, the mean pre-anesthesia and pre-incision PTH were 52.1 ± 17.2 pg/ml and 132 ± 39.6 pg/ml, respectively (Table 1). The mean percentage increase from pre-anesthesia to pre-incision PTH was 148 ± 90.7% (range: 42 - 494%). In the parathyroidectomy group, the mean pre-anesthesia and pre-incision PTH were 158 ± 141 pg/ml and 254 ± 231 pg/ml, respectively. The mean percentage increase from pre-anesthesia to pre-incision PTH was 32.7 ± 34.4 % (range: 1 - 129%). The differences in percentage PTH increases between two groups were significant ($p<0.05$). PTH normalized postoperatively in all patients in both groups.
- No incidence of postoperative vocal cord paresis or paralysis was observed.

## Discussion

- IOPTH increased immediately after anesthesia induction in both total thyroidectomy and parathyroidectomy.
- The total thyroidectomy group showed much higher percentage increase of PTH in response to anesthesia. However, there was no statistically significant difference in absolute PTH increases between two groups.
- While PTH is mainly regulated by serum calcium levels, it is partly influenced by alpha-adrenergic stimulation. It has been demonstrated that laryngoscopy with endotracheal intubation causes the highest increase in serum catecholamine levels among various anesthetic modalities such as monitored anesthesia care (MAC).
- Overall, our findings suggest the using IOPTH for post-thyroidectomy hypocalcemia or parathyroidectomy requires a better understanding of anesthetic effects to improve its predictive and interpretive accuracy.

## Conclusion

- Anesthesia and associated techniques increase intraoperative parathyroid hormone (IOPTH) levels in total thyroidectomy and parathyroidectomy. This phenomenon should be taken into consideration when using IOPTH as a therapeutic or predictive marker in head and neck endocrine surgery.

## Reference

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