Role of Intact Parathyroid Hormone Level as an Early Predictor of Postoperative Hypocalcemia after Total Thyroidectomy for Simple Multi-Nodular Goiter

Thesis

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List of Abbreviations

Abb.	Full term
Ca	*Calcium*
CaSR	*Calcium Sensing Receptor*
CCA	*Common Carotid Artery*
EBSLN	*External Branch of the Superior Laryngeal Nerve*
ECA	*External Carotid Artery*
GFR	*Glomerular Filtration Rate*
IBSLN	*Internal Branch of Superior Laryngeal Nerve*
ICA	*Internal Carotid Artery*
IP	*Inferior Parathyroid*
iPTH	*Intact Parathyroid Hormone*
iPTH-24hr	*Identify Parathyroid Hormone -24*
ITA	*The Inferior Thyroid Artery*
LGT	*Levator Glandulae Thyroideae*
LMA	*Laryngeal Mask Anesthesia*
PTH	*Parathyroid Hormone*
RLN	*The Recurrent Laryngeal Nerve*
SCM	*Sternocleidomastoid*
SLN	*Superior Laryngeal Nerve*
SMNG	*Simple Multi-nodular Goiter*
SMNG	*Simple Multi-nodular Goiter*
SP	*Superior Parathyroid*
STA	*Superior Thyroid Artery*
TALH	*The Loop of Henle*
VDR	*Vitamin D Receptor*

ABSTRACT

These results indicate that a low serum intact PTH level after thyroidectomy is an earlier predictor of hypocalcaemia than serum calcium levels alone.

Serum PTH 24-h after total thyroidectomy is a reliable predictor of hypocalcaemia and can allow safe early discharge of patients from hospital. Patients with a normal postoperative serum PTH and normal serum calcium the following morning will not develop hypocalcaemia and can be considered for discharge that day. Measuring %iPTH decline, where a decline >72.3% was precise for early diagnosis of hypocalcemia after total thyroidectomy too. Our study didn't find a difference, between combination of both tests and measuring iPTH24hr only, also did not increase the accuracy. Thus, calculation of the %iPTH decline might not be necessary. Only using a single measurement of iPTH24hr is more convenient and cost-effective in early diagnosis of immediate significant postoperative hypocalcemia.

Keywords: Internal Branch of Superior Laryngeal Nerve- Glomerular Filtration Rate - External Carotid Artery

INTRODUCTION

Thyroid surgery has a history of significant changes in the technique and the incidence of complications. Continuous developments in surgical techniques and better understanding of thyroid anatomy and pathology have increased the safety of thyroid surgery and reduced the incidence of complications. Nowadays, the rate of postoperative mortality is extremely low. The most common and potentially life-threatening complications in thyroid gland surgery are vocal cord palsy and hypocalcemia ***(Khafagy and Abdelnaby, 2013).***

Preservation of the parathyroid glands during total thyroidectomy is a major concern for an endocrine surgeon, because there is no guarantee of normal postoperative parathyroid function, even if the procedure is performed for benign disease. It is especially difficult to keep the parathyroid glands intact if a tumor is large, infiltrative or if there are extensive lymph node metastasis. According to one systematic review, the median incidences of transient and permanent hypocalcemia were 27% and 1%, respectively, but at the worst, these rates were as high as 38% and 3%, respectively ***(Park et al., 2016).***

Early postoperative calcium monitoring, although important, is a poor predictor of subsequent symptomatic hypocalcemia. Despite the fact that the slope of postoperative serum calcium levels correlates with the development of

symptomatic hypocalcemia, its utility is limited as the results are not available until 24–48 hours post-thyroidectomy. Other approaches to monitor and predict postoperative parathyroid function and subsequent hypocalcemia have been described in the literature. These include parathyroid hormone (PTH) assayed either intraoperatively or in the early postoperative period. These approaches are based on the fact that intact PTH (iPTH) has a short half-life of 1–4 minutes, thus allowing detection of its fall early in the perioperative period ***(AlQahtani et al., 2014).***

The nadir for hypocalcemia typically occurs at around 24–48 hours postoperatively but may be as delayed as post-op day 4. Therefore, detecting patients requiring calcium replacement therapy with serial calcium measurements can take multiple blood tests over several days. Placing all patients on calcium therapy unnecessarily commits many patients to unnecessary treatment and puts them at risk for hypercalcemia. A clinical laboratory method for early prediction of postoperative hypocalcemia could, therefore, facilitate earlier implementation of treatment, and early discharge (≤24 hours) ***(Le et al., 2014).***

In the context of escalating health care costs, a number of initiatives have focused on various ways to facilitate timely hospital discharge without compromising patient safety. The importance of a reliable measure to predict a person's relative risk for developing clinically significant hypocalcemia

following thyroidectomy should not be underestimated. Besides facilitating timely discharge in low-risk patients, classification of high-risk patients would also allow prompt prophylactic treatment. Unfortunately, the classification of patients into relative risk levels for subsequent hypocalcemia is not always straightforward. Because of its relatively shorter half-life, changes in parathyroid hormone (PTH) precede changes in calcium by hours. Intraoperative PTH has been less readily adopted for use during thyroidectomy. Among those who have used PTH as a guide for guiding management after thyroidectomy, differing reports exist regarding the sensitivity and specificity of PTH for accurately predicting hypocalcemia. Some studies even report seemingly contradictory results. There is no consensus about the best time to obtain PTH levels for accurately predicting a patient's risk for clinically significant hypocalcemia. It is also unclear whether the absolute value of PTH versus the percentage change from preoperative to intraoperative/postoperative levels is a better predictor for postoperative hypocalcemia ***(David et al., 2015).***

AIM OF THE WORK

This is a prospective study to estimate the incidence of hypocalcemia and hypo-parathyroidism following total thyroidectomy for simple multi-nodular goiter (SMNG), and to determine which early clinical and biochemical characteristics could be considered as predictive factors. Also to identify PTH-24 (iPTH-24hr) as a simple predictor of early postoperative hypocalcemia.