Early and Late Hypocalcaemia after Total Thyroidectomy Prospective Study

Thesis

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By

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Mina Gad Shenouda

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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 PTH assayed either intraoperatively or in the early postoperative period. These approaches are based on the fact that intact PTH 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

Is to assess the incidence of postoperative hypocalcaemia post total thyroidectomy wither it's temporary or permanent.

Chapter 1
EMBERIOLOGY AND ANATOMY OF THYROID GLAND

EMBRIOLOGY

The parathyroid glands arise from endodermal epithelial cells, in conjunction with the thymus. Four parathyroid glands are present in 85% of the population, and about 15% have more than four glands ***(Doherty, 2010)***.

The upper parathyroid arises from the fourth branchial pouch, which also gives rise to the thyroid gland. The lower parathyroid arises from the third branchial pouch in association with the thymus ***(Decker et al., 2009)***.

The inferior parathyroid glands are derived from the third branchial pouch. The parathyroid remains closely associated with their respective branchial pouch derivatives ***(Brunicardi et al., 2005)***.

These glands are closely associated with the thymus and have a longer line of embryologic descent, which leads to more variability in their anatomic position. The locations of ectopic parathyroid glands are related to the common origins of parathyroid, thyroid, and thymic tissue. The third branchial pouch contributes to thymus development as well as parathyroid and thyroid development. Both the third and fourth

branchial pouches also contribute to thyroid development ***(Hojaij et al., 2012).***

The position of normal superior parathyroid glands is more consistent, with 80% of these glands being found near the posterior aspect of the upper pole and the middle part of the thyroid lobe, at the level of the cricoid cartilage. Approximately 1% of normal upper glands may be found in the paraesophageal or retroesophageal space. Enlarged superior glands may "descend by gravity" in the tracheoesophageal groove and come to lie caudal to the inferior glands. Truly ectopic superior parathyroid glands are rare, but may be found in the middle or posterior mediastinum, commonly in the aortopulmonary window ***(Brunicardi et al., 2005)***.

Inferior parathyroids can be found as high in the neck as the carotid sheath and can also be found in the anterior mediastinum or even the pericardium. However, the majority of inferior parathyroids are found near the inferior pole of the thyroid ***(Brunicardi et al., 2005)***.

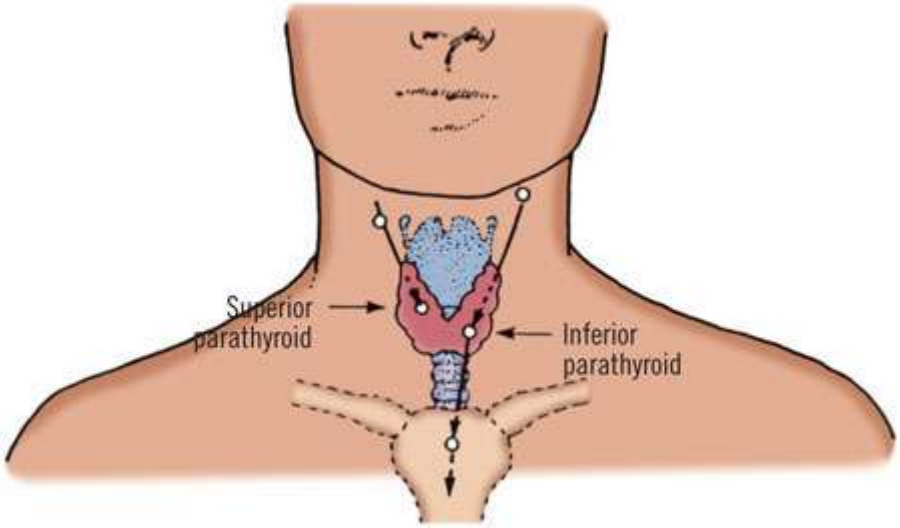

Figure (1): The migratory pathways of the parathyroid glands. The glands may be found at any point along those pathways, usually at the levels indicated by the horizontal arrows ***(Gray et al., 1976).***

As the embryo matures, the thymus and inferior parathyroids migrate together caudally in the neck. The most common location for inferior glands is within a distance of 1 cm from a point centered where the inferior thyroid artery and recurrent laryngeal nerve cross. Approximately 15% of inferior glands are found in the thymus in the anterior mediastinum ***(Doherty, 2010).***

The position of the inferior glands, however, tends to be more variable as a consequence of their longer migratory path. Undescended inferior glands may be found near the skull base, angle of the mandible, or superior to the superior parathyroid glands, along with an undescended thymus ***(Brunicardi et al., 2005).***

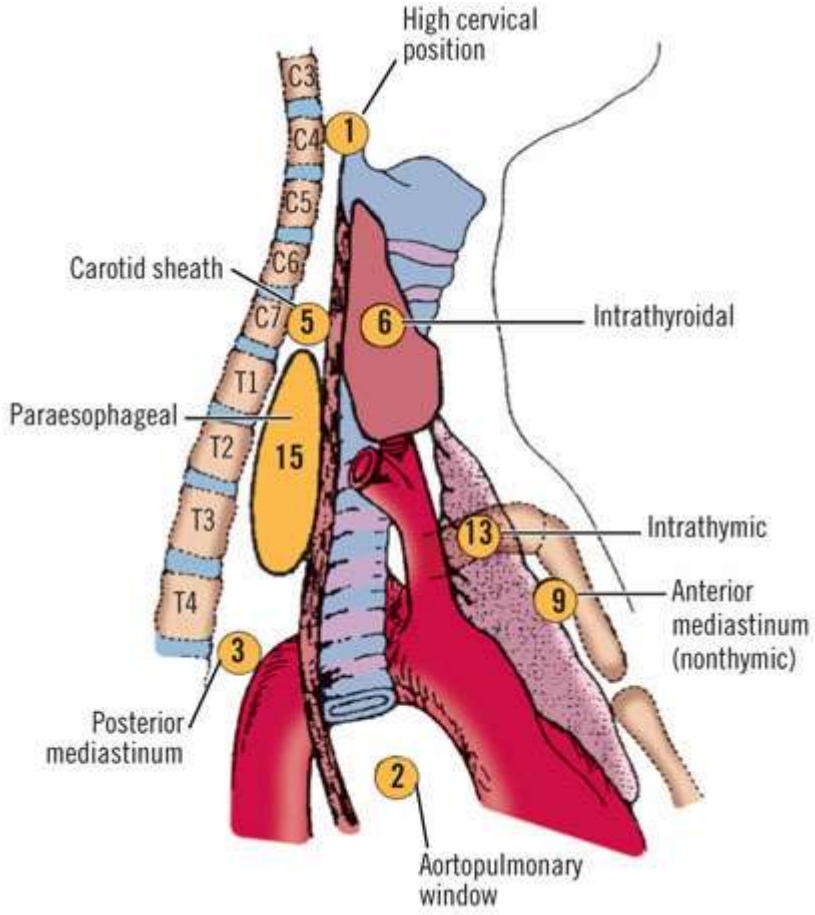

Figure (2): Anatomic locations of ectopic parathyroid glands, with number found in each location (n=54) ***(Shen et al., 1996).***

The frequency of intrathyroidal glands varies in the literature from 0.5 to 3%, with some authors considering upper glands to be more likely to occur in this location because of the close embryologic association of the upper glands and the lateral thyroid anlage. Intrathyroidal parathyroid glands account for about 8% of patients with persistent hyperparathyroidism ***(Brunicardi et al., 2005).***