VALIDITY OF EARLY PARATHYROID HORMONE ASSAY AS A DIAGNOSTIC TOOL FOR SUB-TOTAL THYROIDECTOMY RELATED HYPOCALCAEMIA

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ABSTRACT
Objective: To determine the validity of early (one hour postoperatively) parathyroid hormone (PTH) assay (≤ 10 pg/ml), keeping gold standard as the serum ionic calcium level, for predicting sub-total thyroidectomy-related hypocalcaemia and to calculate the sensitivity and specificity of latent signs of tetany.

Study Design: Cross-sectional validation study.

Place and Duration of Study: Department of General Surgery, Pakistan Institute of Medical Sciences, Islamabad from August 2008 to August 2010.

Methodology: Patients undergoing sub-total thyroidectomy were included by convenience sampling. PTH assay was performed 1 hour post sub-total thyroidectomy. Serum calcium levels were performed at 24 and 48 hours, 5th day and 2 weeks after surgery. Cases that developed hypocalcaemia were followed-up for a period of 6 months with monthly calcium level estimation to identify cases of permanent hypocalcaemia. Symptoms and signs of hypocalcaemia manifesting in our patients were recorded. Data was analyzed through SPSS version 10. 2 x 2 tables were used to calculate sensitivity and specificity of PTH in detecting post-thyroidectomy hypocalcaemia.

Results: Out of a total of 110 patients included in the study, 16.36% (n=18) developed hypocalcaemia including 1.81% (n=2) cases of permanent hypoparathyroidism. The sensitivity of one hour postoperative PTH assay as a predictive tool for post-thyroidectomy related hypocalcaemia was 94.4% while its specificity was 83.6% with 53% positive predictive value and 98.7% negative predictive value.

Conclusion: One hour post sub-total thyroidectomy PTH assay can be helpful in predicting post sub-total thyroidectomy hypocalcaemia. Moreover, it can be useful in safe discharge of day-care thyroidectomy patients.

Key Words: Hypocalcaemia. Parathyroid hormone assay. Sub-total thyroidectomy. Day-care surgery.
METHODOLOGY

This descriptive study was conducted at the Department of General Surgery, Pakistan Institute of Medical Sciences, Islamabad, from August 2008 to August 2010. Patients undergoing sub-total thyroidectomy, for any cause, aged between 15 - 65 years were included in the study. Patients not consenting to be a part of the study and those with already deranged calcium levels due to any reason were excluded from the study. After taking permission from the hospital ethics committee and informed written consent from the patient, data was collected through a Proforma.

Initial assessment was done with adequate history, thorough physical examination and relevant investigations. PTH assay was performed 1 hour post sub-total thyroidectomy. Serum calcium levels, adjusted with albumin, were performed at 24 and 48 hrs, 5th day and 2 weeks after surgery. A follow-up period of 6 months was advised to identify cases of permanent hypocalcaemia and monthly serum calcium estimations were done for those patients who did not settle. Signs of hypocalcaemia manifesting in the patients were also recorded. Signs of latent tetany were also elicited and recorded.

Statistical Package for Social Sciences (SPSS) version 10 was used to report quantitative variables and frequencies with percentages for qualitative data. 2 x 2 tables were constructed to calculate sensitivity and specificity of PTH and signs of latent tetany in detecting post-thyroidectomy hypocalcaemia.

RESULTS

A total of 110 patients were included in the study. Mean age at presentation was 38 ± 13 years; ranging from 17 - 65 years. Eighty seven (79%) patients were females and 21% (n=23) were males.

Eighteen (16.36%) of the patients developed hypocalcaemia, 1.81% (n=2) developed permanent; hypocalcaemia while 14.54% (n=16) developed transient hypocalcaemia.

The sensitivity of PTH was found to be 94.4% while specificity was 83.6%. The positive predictive value of PTH assay as a predictor of postoperative hypocalcaemia was found to be 53% while its negative predictive value was 98.7% (Table I).

The sensitivity of the Chvostek’s sign was found to be 88.8% while its specificity was 60%. The positive predictive value of Chvostek’s sign as a sign of latent tetany was 30% while its negative predictive value was 96.4% (Table I).

Trousseau’s sign as a predictor of latent tetany was found to have a sensitivity of 94.4% and a specificity of 93.4%. Its positive predictive value was 74% while its negative predictive value was 98.8% (Table I).

DISCUSSION

Sub-total thyroidectomy is a fairly common procedure and is being carried out quite frequently at the study setup where cases are received from the endemic goiter belt of the Himalayas as well as plain endemic goiter areas. For better turnover, cost effectiveness and patient satisfaction, there has been a drive in the recent past to convert it into a day care procedure. For an early discharge, patient’s safety must never be compromised.4 Hematoma, hemorrhage, bilateral recurrent laryngeal nerve palsy and hypocalcaemia are the main life threatening complications of this surgery, the latter also being reported as the most common with an incidence up to 30% in literature.7 The conventional method of detecting this complication is serum calcium monitoring in symptomatic patients which requires an extended hospital stay.

Many researchers tried to ascertain the role of postoperative calcium level and its ability to predict post-thyroidectomy hypocalcaemia. However, the applicability of these methods did not translate well into early
patient discharge and cost effectiveness, as no definite cut off value was found in later studies. Researchers advocated the use of calcium and vitamin D substitute to all or high risk patients. However, many researchers observed that this practice was not cost effective and also prevented the detection of true candidates for calcium replacement. For the past two decades, PTH assays have been used to predict post-thyroidectomy hypocalcaemia. Different cut off values have been quoted by different researchers ranging from 8 pg/dl to 15.5 pg/dl. Other researchers sought to find the ideal time to draw blood for the test; from intra-operative PTH, PTH sample drawn at skin closure to several hours postoperatively and found that the results were almost the same (Table II).

Some researchers such as Lang et al. also compared the accuracy of PTH at skin closure with that of conventional serial calcium monitoring and found that PTH had a higher specificity than the calcium slope and also that combining the two did not improve the sensitivity and specificity much. Some researchers have also worked on the combined use of PTH and calcium threshold levels. However, a recent study by Jumailly et al. concluded that the combined use was not significantly better than using PTH threshold alone.

In this study, 10 pg/dl was taken as the cut-off value and the sample was taken in the recovery room, within an hour of the procedure. Serial calcium assays were carried out 1 hour, 24 hours, 48 hours, 5th day and 2 weeks after surgery. Cases of hypocalcaemia were followed for a period of 6 months to identify cases of permanent hypocalcaemia. Sensitivity, specificity, negative predictive value and positive predictive value of PTH as a predictive test were assessed using actual serum calcium level as the gold standard. Similarly, Chvostek's and Trousseau's sign of latent tetany were performed as day-care procedure. Chvostek's sign has a very helpful test, yet, there are certain difficulties to the hospital has its own machine. In short, though PTH is a very helpful test, yet, there are certain difficulties to it in our setup and until those are dealt with, the practical applicability of this test would be limited.

The sensitivity of the Chvostek's sign was found to be 88.8% while its specificity was 60%. The positive predictive value of Chvostek's sign as a sign of latent tetany was 30% while its negative predictive value was 96.4%. This sign was positive in about 30% of the normal patients as well so it was generally not found very useful.

The Trousseau's sign as a predictor of latent tetany was found to have a sensitivity of 94.4% and a specificity of 93.4%. Its positive predictive value was 74% while its negative predictive value was 98.8%. As this sign had better NPV and PPV, it was found beneficial to detect latent tetany.

This study can be taken as a pilot project; this test is useful, applicable, and beneficial and is cost-effective if the hospital has its own machine. In short, though PTH is a very helpful test, yet, there are certain difficulties to it in our setup and until those are dealt with, the practical applicability of this test would be limited.

CONCLUSION
Hypocalcaemia is a well-known complication of sub-total thyroidectomy. One hour post-thyroidectomy PTH assay with a cut-off value of 10 pg/dl has good sensitivity (94.4%) and specificity (83.6%) and is especially helpful in predicting post-thyroidectomy hypocalcaemia due to hypoparathyroidism when sub-thyroidectomy is performed as day-care procedure. Chvostek's sign has low specificity of 60% in detecting latent tetany, however, Trousseau's sign is very helpful with specificity of 93.4% in detecting latent tetany.

REFERENCES


