Original Research Article

Identification of patients at high risk for hypocalcemia after total thyroidectomy with serial calcium estimation and intact parathyroid hormone levels—a comparative study

Pauly T. J.*, Santhosh P. V., Santhosh T. V., Vinodh M.

Department of Surgery, Government Medical College M. G. Kav, Thrissur, Kerala 680596, India

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*Correspondence:
Dr. Pauly T. J.,
E-mail: paulytj@gmail.com

ABSTRACT

Background: In recent years, multiple retrospective and prospective studies have emerged, which support the use of postoperative serum intact parathyroid hormone (iPTH) levels can also predict hypocalcemia in postoperative thyroidectomy patients. Therefore, the present study was designed to determine the incidence of hypocalcaemia after total thyroidectomy.

Methods: 146 patients who underwent total thyroidectomy were recruited. The incidence of hypocalcaemia was analyzed with serial calcium estimation results with 6 hours, 24 hours, 48 hours and 2 weeks post-operative calcium level estimations. The incidence of hypocalcaemia with regards to the number of parathyroid glands was determined and the results between the three groups were compared.

Results: The incidence of transient hypocalcaemia at 24hr postoperative period and intact parathyroid hormone (iPTH) level showed a significant difference (p<0.001). 49% of the patients were with calcium levels <8 mg/dl in first 24hrs of serial calcium estimation in comparison with the 51% parathormone level with <15pg/dl was also showed a significant difference (p<0.001). Calcium levels less than 8 mg/dl. The serial calcium level after 2wks with features of hypocalcemia (<8mg/dl) were 18% and was more predictable and cost effective than intact parathyroid hormone (i PTH) estimation which require Rs.1000-1200 in comparison with the serial calcium estimation of around Rs. 400.

Conclusions: The serial calcium level estimations are more predictable and coast effective than intact parathyroid hormone (i PTH) estimation in predicting long term post-operative hypocalcaemia after total/near total thyroidectomy.

Keywords: Hypocalcaemia, i PTH, Thyroidectomy

INTRODUCTION

Hypocalcaemia is one of the most common complications following total thyroidectomy, occurring in 10-50% of cases. It is usually transient, but can be permanent in 0.5–10.6% of patients. It is caused by parathyroid revascularization, stunning, or incidental removal of the parathyroid glands. The nadir for hypocalcaemia 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 hypocalcaemia. A clinical laboratory method for early prediction of postoperative hypocalcaemia could, therefore, facilitate earlier implementation of treatment, and early discharge (≤24 hours).

In recent years, multiple retrospective and prospective studies have emerged, which support the use of
postoperative serum intact parathyroid hormone (iPTH) levels can also predict hypocalcaemia in postoperative thyroidectomy patients. Different groups have published considerable research on this topic, demonstrating that 1 and 6-hour postoperative PTH and Calcium levels had a high sensitivity and specificity of detecting postoperative hypocalcaemia.

The purpose of this study is to determine the number of high-risk patients who develop hypocalcaemia after total thyroidectomy by serial calcium level estimation in 6 hours, 24 hours, 48 hours and 2 weeks of post-operative period and post-operative intact parathyroid hormone (iPTH) level estimation and comparing predictive value in permanent hypocalcaemia.

METHODS

The present study was conducted after the institutional ethical clearance. The study included 146 patients who are subjected to total thyroidectomy after the informed and written consent from all the patients.

The preoperative number of parathyroid glands identified in all the patients and the serial calcium levels were estimated. The patients who were admitted for total/near total thyroidectomy belonging to different age group of both genders were included.

Patients having abnormal preoperative serum calcium level below the normal range of 8 mg/dl in the retrospective series were excluded. The parameters assessed were post-operative serial calcium levels in 6 hours, 24 hours, 48 hours and 2 weeks. The number of parathyroid glands identified peroperatively was recorded.

Then the patients were allotted to 3 groups namely, Group-1 (with <2 parathyroid glands), Group-2 (with 2 parathyroid glands) and Group-3 (with >2 parathyroid glands).

Meticulous dissection without much use of monopolar or bipolar cautery, identifying the glands by its color, texture and position is followed. Post-operative serum calcium level and intact parathyroid hormone (iPTH) levels were estimated using commercially available kit according to the manufacturer’s guidelines.

Statistical analysis

The number of patients belongs to different group on the basis of serum calcium level was represented as percentage. Chi square test was used to find out the statistical significance. P value less than 0.005 was considered significant.

RESULTS

The present study included a total 146 patients. Among them 9% belong to Group-1, 42% belong to Group-2 and 49% belong to Group-3 (Table 1).

Table 1: Number of patients belongs to different group. N=146.

<table>
<thead>
<tr>
<th>Group</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-1</td>
<td>13(9%)</td>
</tr>
<tr>
<td>Group-2</td>
<td>61(42%)</td>
</tr>
<tr>
<td>Group-3</td>
<td>72(49%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group vs Time period</th>
<th>Number of patients according to their serum calcium level n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;8 mg/dl</td>
<td>&gt;8 mg/dl</td>
</tr>
<tr>
<td>6 hours post-operative period</td>
<td>43(29%)</td>
<td>103(71%)</td>
</tr>
<tr>
<td>24 hours post-operative period</td>
<td>37(25%)</td>
<td>109(75%)</td>
</tr>
<tr>
<td>48 hours post-operative period</td>
<td>29(20%)</td>
<td>117(80%)</td>
</tr>
<tr>
<td>2 weeks post-operative period</td>
<td>27(18%)</td>
<td>119(82%)</td>
</tr>
</tbody>
</table>

The incidence of transient hypocalcaemia at 24hr postoperative period and intact parathyroid hormone (iPTH) level was estimated and compared. It showed a significant difference (Figure 1, p<0.001).

But the permanent hypocalcaemia which required calcium supplementation were more accurate with serial calcium estimation than the intact parathyroid hormone (iPTH) levels obtained after total/near total thyroidectomy. 49% of the patients were with calcium levels <8 mg/dl in first 24hrs of serum calcium estimation in comparison with the 51% parathormone level with 15pg/dl was observed. On statistical analysis, it showed a significant difference (Figure 2, p<0.001). 41% of the patients were with calcium levels <8 mg/dl in first 24hrs of serum calcium estimation in comparison with the 39% parathormone level with 15pg/dl was observed.

On statistical analysis, it also showed a significant difference (Figure 3, p<0.001). The serial calcium level
DISCUSSION

The present study aimed at identifying the patients at high risk of developing hypocalcaemia following total thyroidectomy by means of retrospective analysis of serial post-operative calcium levels in 6 hours, 24 hours, 48 hours and 2 weeks of post-operative period and post-operative intact parathyroid hormone (iPTH) level estimation and comparing predictive value in assessing permanent hypocalcaemia. The incidence of transient hypocalcaemia up to 24 hours of serum calcium and intact parathyroid hormone (iPTH) levels were comparable. But the permanent hypocalcaemia which required calcium supplementation were more accurate with serial calcium estimation than the intact parathyroid hormone (iPTH) levels obtained after total/near total thyroidectomy.

25% of the patients were with calcium levels <8 mg/dl in first 24hrs of serial calcium estimation in comparison with the 26% intact parathyroid hormone (iPTH) levels <15pg/dl i.e. Calcium levels less than 8 mg/dl. The serum calcium level after 2wks with features of hypocalcaemia (<8mg/dl) were 18% which is more predictable and cost effective than intact parathyroid hormone (iPTH) estimation which showed 26%. In the classic presentation of primary hypoparathyroidism, the characteristic biochemical hallmark, hypocalcaemia is not always seen.11 From time to time, the serum calcium may be normal. However, most of the time, the serum calcium in these patients is elevated. It is important to distinguish the patient with hypocalcaemia whose serum calcium can be normal occasionally from the entity that has surfaced more recently in which the serum calcium is always normal.12-15 The old literature, in fact, described some cohorts as “normocalcemic”, while more careful inspection has shown that these patients were intermittently normocalcemic.16-20

The incidence of permanent hypocalcaemia which required calcium supplementation was more accurate with serial calcium estimation than the intact parathyroid hormone (iPTH) levels obtained after total thyroidectomy. The serial calcium level estimations are more predictable and cost effective than intact parathyroid hormone (iPTH) estimation in predicting long term post-operative hypocalcaemia after total/near total thyroidectomy. In first 24 hours the combined evaluation gives more accurate results than the individual evaluations.

CONCLUSION

In conclusion, we propose herewith the serial calcium level estimations are more predictable and cost effective than intact parathyroid hormone (iPTH) estimation in predicting long term post-operative hypocalcaemia after total thyroidectomy. In first 24 hours the combined evaluation gives more accurate results than the individual evaluations.

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REFERENCES
