

Original Research

Role of Intraoperative parathyroid hormone (IOPTH) assay in surgical management of primary hyperparathyroidism (PHP) patients

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ABSTRACT:

Background: Parathyroid hormone (PTH) is an 84-amino-acid peptide, synthesized and released by parathyroid chief cells in response to hypocalcemia. Primary hyperparathyroidism (PHPT) results from inappropriate overproduction of parathyroid hormone from one or many parathyroid glands and presents with hypercalcemia. Hence; we planned the present study to evaluate the level of PTH intraoperatively and postoperatively. **Materials & methods:** A total of 30 patients were included in the present study that fulfilled the inclusion and exclusion criteria and reported during the study period. General physical examination and local examination of the neck of all the patients was also done at the time of admission. Preoperative PTH hormone and serum calcium levels estimation was done. Ultrasonography performed with neck extended in the supine position, with the thyroid gland as the reference was done. Minimal invasive parathyroidectomy was carried out. A 50% reduction in PTH level from baseline was used as an indication that the exploration was successful. **Results:** MIN invasive parathyroidectomy was done in 93.33 % of the cases while it was not done only in two cases. Neck exploration was required only in two cases while in remaining 28 cases, no neck exploration was required. Mean PTH levels pre-operatively, at 10 minutes, 30 minutes and 24 hours post-operatively were 613.5, 231.5, 102.3 and 101.2 respectively. Significant results were obtained while comparing the mean PTH levels at different time intervals. **Conclusion:** A targeted MIP guided by preoperative radiological localization and IOPTH can achieve an excellent operative success rate.

Key words: Parathyroid hormone, Intraoperative

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INTRODUCTION

Parathyroid hormone (PTH) is an 84-amino-acid peptide, synthesized and released by parathyroid chief cells in response to hypocalcemia. PTH mobilizes calcium by increasing calcium resorption from bone and by raising calcium reabsorption in the proximal kidney tubule. Abnormalities of the parathyroid glands are the commonest cause of hypercalcaemia and the histopathologist has an important role in classifying the underlying pathological condition. The molecular and genetic events underlying parathyroid disease are complex, heterogeneous, overlapping and poorly understood. One such disorder of parathyroid gland is hyperparathyroidism.¹⁻³

Primary hyperparathyroidism (PHPT) results from inappropriate overproduction of parathyroid hormone from one or many parathyroid glands and presents with hypercalcemia. Secondary hyperparathyroidism

occurs as a normal response to hypocalcemia due to diseases affecting the kidney (such as renal tubular acidosis), liver, intestines and vitamin D deficiency. Tertiary hyperparathyroidism occurs in patients with long-standing secondary hyperparathyroidism who develop autonomous PTH production with hypercalcemia. In India, PHPT is still a symptomatic disease. Various pre-operative localization studies are targeted to reduce the surgical operative time and to avoid un-necessary dissection. The conventional time-honored operation employing general endotracheal anesthesia and bilateral cervical exploration is safe and effective when performed by experienced surgeons. However, recent technical innovations, including improved preoperative localization and availability of rapid intraoperative PTH assays (IOPTH), have yielded focused approaches with excellent outcomes. In the surgical management of PHPT intraoperative PTH (IO-PTH)

assays have been shown to improve the success of parathyroid gland surgery. Minimally invasive parathyroidectomy (MIP) has replaced the traditional four-gland bilateral exploration as the procedure preferred by many institutions.⁴⁻⁶ Intraoperative parathyroid hormone (IOPH) assay has allowed a directed parathyroid exploration with cure rates (>97%) comparable with those of bilateral exploration in patients with primary hyperparathyroidism (PHP).⁵⁻⁷ Hence; we planned the present study to evaluate the level of PTH intraoperatively and postoperatively.

MATERIALS & METHODS

The present study was conducted in the department of General Surgery and it included evaluation of the level of PTH intraoperatively and postoperatively. A total of 30 patients were included in the present study that fulfilled the inclusion and exclusion criteria and reported during the study period. Inclusion criteria included: patients with primary hyperparathyroidism who have intact parathyroid hormone with raised or mid to high normal hormone in the setting of raised total or ionised calcium after exclusion of conditions that mimic PHPT. Complete demographic and clinical details of all the patients were assessed. General physical examination and local examination of the neck of all the patients was also done at the time of admission. Preoperative PTH hormone and serum calcium levels estimation was done.

Ultrasonography performed with neck extended in the supine position, with the thyroid gland as the reference was done. Minimal invasive parathyroidectomy was carried out. A 50% reduction in PTH level from baseline was used as an indication that the exploration was successful. All the results will be analyzed by SPSS software. Chi-square test and student t test were used for assessment of level of significance.

RESULTS

A total of 30 patients were assessed. Mean age of the patients was 45.8 years. Out of 30 patients, 24 were males while the remaining 6 were females. In the present study, we observed that pain was the most common clinical presentation, seen in 53.33% of the subjects. Weakness occurred in 26.67% of the subjects while vomiting was seen in 13.33% of the subjects. Weight loss, fever and altered taste sensation was seen in 10% of patients each. MIN invasive parathyroidectomy was done in 93.33 % of the cases while it was not done only in two cases. Neck exploration was required only in two cases while in remaining 28 cases, no neck exploration was required. Mean PTH levels pre-operatively, at 10 minutes, 30 minutes and 24 hours post-operatively were 613.5, 231.5, 102.3 and 101.2 respectively. Significant results were obtained while comparing the mean PTH levels at different time intervals.

Table 1: Distribution of subjects according to clinical presentation

Clinical Presentation	No. of Patients	Percentage
Altered sensorium	3	10
Weakness	8	26.67
Pain	16	53.33
Swelling	1	3.33
Vomiting	4	13.33
weight loss	3	10
Fever	3	10
Other	6	20

Table 2: Distribution of subjects according to MIN invasive parathyroidectomy

MIN Invasive parathyroidectomy	No. of Patients	Percentage
No	2	6.67%
Yes	28	93.33%
Total	30	100.0%

Table 3: Mean value and SD of values of PTH parameter

Parameter	Mean	SD	p- value
PTH Pre	613.5	412.8	0.000 (Significant)
PTH 10 minutes	239.4	231.5	
PTH 30 minutes	128.4	102.3	
PTH 24 minutes	88.4	101.2	

DISCUSSION

MIP involves the use of unilateral neck exploration under regional or local anesthesia. MIP first introduced in 1995, has risen in popularity as a result

of smaller incisions, decreased operative time and less associated morbidity when compared to traditional surgery. MIP relies on accurate preoperative localization of solitary parathyroid

adenoma. Sestamibi (MIBI) scans and ultrasonography (USG) are commonly used for preoperative localization of hyper functioning parathyroid glands.⁶⁻⁹ Hence; we planned the present study to evaluate the level of PTH intraoperatively and postoperatively.

A total of 30 patients were assessed. Mean age of the patients was 45.8 years. Out of 30 patients, 24 were males while the remaining 6 were females. In the present study, we observed that pain was the most common clinical presentation, seen in 53.33% of the subjects. Neck exploration was required only in two cases while in remaining 28 cases, no neck exploration was required. Our results were in concordance with the results obtained by previous authors who also reported similar findings. Helbrow J et al, in a previous study, reviewed 78 consecutive patients who underwent parathyroid surgery by a single surgeon with a special interest in parathyroid surgery. The clinical impact of IOPTH monitoring was recorded postoperatively in a timely manner. Serum adjusted calcium levels were checked preoperatively (on admission) and one month postoperatively; normalisation was considered a cure. In the setting of curative MIP, IOPTH measurement did not influence the management in any of the patients but it could have led to bilateral parathyroid exploration (BPE) in three instances. Similarly, in cases that required lengthening of the MIP incision, IOPTH results did not influence patient management although it could have led to BPE in one case. MIP offers an effective cure for patients with hyperparathyroidism. The addition of IOPTH testing adds increased expense, operating time and risk to patients otherwise suitable for MIP.¹⁰

In the present study, mean PTH levels pre-operatively, at 10 minutes, 30 minutes and 24 hours post-operatively were 613.5, 231.5, 102.3 and 101.2 respectively. Significant results were obtained while comparing the mean PTH levels at different time intervals. Bobanga ID et al determined if intraoperative parathyroid hormone (PTH) monitoring is necessary in patients with concordant ultrasound and sestamibi imaging. Gland weight and preoperative PTH levels were greater for patients with concordant operative and imaging findings ($p < 0.05$). Six percent of patients with concordant ultrasound and sestamibi imaging had unexpected intraoperative findings.¹¹ In another study conducted by Thielmann A et al, authors validated the approach of treating primary hyperparathyroidism using sestamibi scan directed parathyroidectomy, without routine use of intraoperative parathyroid hormone measurements (ioPTH). The overall disease control (eucalcemia) rate was 95%. 3/111 (3%) of patients who had surgery without ioPTH measurements required re-exploration. Selective use of ioPTH is an effective strategy. ioPTH is best reserved for patients who have non-localizing preoperative imaging, are at

risk for multi-gland disease, or require revision surgery.¹²

CONCLUSION

A targeted MIP guided by preoperative radiological localization and IOPTH can achieve an excellent operative success rate.

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