

To Study the Utility of Intra Operative Parathyroid Hormone Levels in Management of Primary Hyperparathyroidism

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ABSTRACT

Introduction: Treatment of primary hyperparathyroidism, caused by single adenoma in atleast 80% of the cases, has undergone a change from traditional bilateral neck exploration to minimal invasive parathyroidectomy. With proper preoperative workup and intraoperative parathyroid monitoring, majority of patients can be successfully treated by minimally invasive parathyroidectomy.

Aim: To compare the sensitivity of preoperative radiological investigation with IOPM to successfully diagnose the site of lesion.

Materials and Methods: We conducted a retrospective review of 50 cases of primary hyperparathyroidism at our institute for a period of 4 years. The lesion was preoperatively localized with the help of diagnostic modalities such as USG neck, Sestamibi scan or CT neck. Intraoperative PTH level monitoring was done as per the decision of the operating surgeon.

Results: A total of 50 parathyroidectomies were performed. 76% of the patients were female with the patients in the age range of 15 to 85 years. The findings of USG neck and Sestamibi scan were concordant in 88% cases. In the rest 12% of the patients USG and sestamibi scans were discordant and Intra operative PTH monitoring was helpful in performing minimally invasive parathyroidectomy. Intraoperative PTH monitoring was done in 52% of the patients. Only one patient had to undergo a bilateral neck exploration, following minimal invasive procedure. Except this case there was no intra-operative or post operative complication.

Conclusion: Excellent results are achievable with minimal invasive parathyroidectomy. Preoperative localization is paramount before taking up the patient for this procedure. We recommend minimally invasive surgery as the procedure of choice in patients with concordant findings of USG neck and Sestamibi scan.

Keywords: Bilateral neck exploration, Intraoperative parathyroid hormone monitoring (IOPM), Parathyroidectom

INTRODUCTION

Primary hyperparathyroidism is the most common cause of hypercalcemia, affecting nearly 1 in 500 women and 1 in 2000 men [1]. Parathyroidectomy for primary HPT has undergone a shift from a traditional bilateral neck exploration to less invasive techniques with smaller incisions and unilateral explorations. Improved preoperative localization imaging and advent of intraoperative parathyroid monitoring (IOPM) have had considerable influence on the way parathyroid surgery is performed [2,3]. Minimally invasive parathyroidectomy (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 [4]. 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. Rapid

iPTH assays known as “biological frozen sections” are used to confirm removal of hyper functioning parathyroid tissue. The PTH has a short half-life, allowing it to serve as a practical intraoperative marker. Study by Lew JI1, Solorzano CC et al., found that a drop of more than 50% in the levels of PTH hormone after 20 minutes of the excision of gland depicted a successful removal of the gland [5].

We reviewed our experience with MIP in management of primary HPT. We sought to determine if IOPM is necessary in all the patients undergoing surgery.

MATERIALS AND METHODS

This was a retrospective study conducted in Dayanand Medical College and Hospital, Ludhiana, which is a tertiary care institute of North India after obtaining institutional review board approval. Patients undergoing surgery for primary hyperparathyroidism in the department of surgery, performed

Symptom	Number Of Patients
Pain Abdomen	14
Renal Calculi	13
Joint Pain	10
Swelling Neck	7
Pancreatitis	7
Altered Sensorium	3

[Table/Fig-1]: Symptom wise distribution

Gland Involved	Number Of Patients	Percentage
Left Inferior	23	46%
Right Inferior	19	38%
Left Superior	3	6%
Right Superior	3	6%
Bilateral Lower	2	4%

[Table/Fig-2]: Gland Wise Distribution

Imaging Used	Total No Of Patients
CT Neck	6
MIBI	45
USG Neck	44

[Table/Fig-3a]: Imaging Modality Used

by different surgeons were included in the study.

Patients with revision procedures, secondary and tertiary HPT, concomitant thyroid disease requiring thyroidectomy, and patients who had undergone previous neck irradiation were excluded from the study.

The study was conducted for 50 patients in the year 2014-2015 and included patients, who were operated in the previous 4 years.

Information collected includes the patients' age, sex, preoperative imaging results and intraoperative findings. Number of patients who underwent USG and/or MIBI scans and/or CT scans were recorded. The results of preoperative MIBI and US studies were defined as concordant or discordant. Number of patients who had concordant or discordant findings on USG and MIBI scans was noted. Use of intraoperative PTH levels was used as and when required or on the discretion of the operating team. Intraoperative PTH monitoring was done in all patients with discordant findings on USG and Sestamibi scan.

RESULT

In our study, the patients had age range of 15 – 85 years, with a mean age of 52 years. 78% of the patients were females. The most common symptoms with which patients presented

Modality(Combination Or Alone)	No Of Cases
USG + MIBI	36
USG+ MIBI + CT	3
USG + CT	1
USG NECK Alone	4
CT NECK Alone	1
MIBI Alone	3
CT + MIBI	2

[Table/Fig-3b]: Various Combination of Modalities Used

S No.	USG	MIBI	Operative Finding	IOPM	CT Finding
1	Lt Inferior	B/L Inferior	Lt Inferior	+	-
2	B/L Superior	No Mass	Lt Superior	+	Lt Superior
3	Rt Superior	Lt Inferior	Rt Superior	+	Rt Superior
4	Right Sided	Rt Inferior	Rt Inferior	+	-
5	Rt Inferior	B/L Lower	Rt Inferior	+	-
6	B/L Superior	Lt Superior	Rt Superior	+	

[Table/Fig-4]: Discordant Findings

were pain abdomen and renal colic in 54% patients [Table/Fig-1]

The mean pre operative calcium was 12.96 mg/dl with range from 9.5 mg/dl to 18.4 mg/dl.

The mean pre operative PTH was 572 pg/ml with range from 107.8 – 3455 pg/ml.

The mean post operative PTH level was 48 pg/ml with range from 8.62 to 70 pg/ml.

Post operatively; it took a mean of 2.5 days for the calcium levels to come down to normal.

Left inferior was the most common lobe to get involved, found in 46% patients [Table/Fig-2].

The primary diagnostic modality and various combinations of techniques were used as per the discretion of the operating team [Table/Fig-3a&b].

Intra operative PTH level monitoring (IOPM) was done in a total of 30 patients. 25 patients had undergone all the three tests i.e. USG, MIBI and IOPM. Out of these 19 patients had concordant USG and MIBI scan. In these patients, IOPM had no extra advantage in the management of patients. In the remaining 6 patients with discordant USG and MIBI findings, IOPM helped us to successfully complete minimally invasive Parathyroidectomy [Table/Fig-4].

USG was correct in predicting the site of adenoma in 95% patients and MIBI in 88% patients [Table/Fig-5]. Though the preoperative USG was better to localize the gland, the difference did not reach statistical significance (p-value= 0.250).

Modality	Total No	Correct	Percent
USG	44	42	95.4
MIBI	45	40	88.0

[Table/Fig-5]: (UsgVs Mibi)

With only USG as the preoperative localizing test, 1 patient had to undergo a redo surgery to achieve final cure. USG had shown right superior gland as the cause of adenoma. MIP was done and the gland was removed. IOPM was not used. The calcium levels failed to return to normal and the biopsy also did not reveal adenoma. On post operative day 5, patient underwent MIBI scan, which revealed right inferior as the cause of adenoma. Then the patient was taken up for bilateral neck exploration. IOPM was used in the second surgery.

DISCUSSION

100% patients with concordant MIBI scan and USG findings underwent successful MIP. Haber et al., found that concordant localization by MIBI scanning and USG had a positive predictive value of 100% in 47 patients [6]. Using the IOPM has greatly enhanced our ability to achieve successful removal of parathyroid adenoma in cases having discordant findings on USG and MIBI scans. The use of IOPM in patients with concordant preoperative localization by USG and MIBI scan adds little in the management and adds unnecessary cost to the surgery. Recent publications by Gawande et al., [7] have not demonstrated improved results using IOPM during parathyroidectomy in patients with concordant preoperative MIBI scanning and US. Agarwal et al., [2] have shown increased cost associated with using IOPM in patients with concordant USG and MIBI findings. With omission of one of the three tests in question, there is a considerable fall in the cost to the patient. The patients undergoing surgery with the preoperative USG scan and IOPM had lower costs than those patients who had undergone preoperative MIBI scan.

Out of 3 parameters i.e. anatomical (USG), functional (MIBI) and biochemical (iPTH assay); combination of any two is diagnostic. In our study, though US had more accuracy than MIBI scan for preoperative localization, the difference was statistically insignificant. With use of only a single preoperative localization technique, surgical failure was found in 1 patient. The patient had to undergo a second surgery to achieve final cure. Thereby, we strongly disprove the use of only one parameter.

Thus, the combination of appropriate preoperative localization with the selective use of IOPM, results in successful surgical outcomes in patients of primary HPT. In conclusion, MIP has become the standard way of dealing with primary HPT. With the advent of improved preoperative localization studies, there are data showing a decreased need for iPTH sampling in patients undergoing initial surgery for primary HPT with preoperative, localizing MIBI scans and concordant US. There is potential to substantially reduce costs associated with laboratory fees, operating room time, and anesthesia time by eliminating the use of iPTH in these patients.

CONCLUSION

Excellent results are achievable with minimal invasive parathyroidectomy. Preoperative localization is paramount before taking up the patient for this procedure. We recommend minimally invasive surgery as the procedure of choice in patients with concordant findings of USG neck and Sestamibi scan.

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