

Management of Hyperparathyroidism - Single Institution Study

Shaik Afzal Ruby¹, Alagappan², Siddharth Polapragada Ventaka Murali³,

¹Shaik Afzal Ruby, M.B.B.S., M.S, DNB (Gen.Surg),Associate Professor, Department of General Surgery, PSGIMS&R, Coimbatore, Tamilnadu

²Alagappan, M.B.B.S., M.S, DNB (Gen.Surg), Assistant Professor, Department of General Surgery, PSGIMS&R, Coimbatore, Tamil Nadu

³Siddharth Polapragada Ventaka Murali, M.B.B.S., Junior Resident, PSGIMS&R, Coimbatore, Tamil Nadu

Corresponding Author: Dr Shaik Afzal Ruby, M.B.B.S., M.S, DNB (Gen.Surg), Associate Professor, Department of General Surgery, PSGIMS&R, Coimbatore, Tamilnadu

Abstract

Background: This study was conducted to elucidate epidemiological patterns of patients who presented to our institution and assess indications, role of preoperative localization, analyse intraoperative details and post-operative recovery and recurrence patterns of those who underwent parathyroidectomy. **Material and Methods:** Data of patients diagnosed with primary hyperparathyroidism from December 2014 to December 2021 were retrieved from medical records. Demographics, preoperative investigations, operative details and follow up were studied. **Results:** Out of 37 patients identified, 29 underwent bilateral neck exploration by collar crease incision and 8 underwent Video assisted Parathyroidectomy. All of our patients were hailing from in and around southern India, with a median age of presentation at 41.38 ± 14 which was congruent with national average as per PHPT registry. Interestingly the gender distribution was at 0.9:1 - female to male ratio, which was drastically different from the national values of 2.4:1. The median duration of surgery averaged 120 minutes for minimally invasive procedures against a global average of 78 minutes, similarly bilateral neck explorations averaged at 180 minutes against 150 minutes, highlighting the need of high-volume centers, while the costs were substantially lower ranging from \$285-\$1821 against global expenditures of \$ 2693-\$ 4112. All but one patient had sestamibi scans done for preoperative localization, in almost all cases ultrasounds were done which yielded information on par with sestamibi. **Conclusion:** Though being a low volume center, surgeon dependent intraoperative localization of parathyroid adenoma without use of any adjuncts was adequate, highlighted by negligible persistence and recurrence rate.

Keywords: Primary Hyperparathyroidism, Minimally Invasive Procedures, Intraoperative Adjuncts.

INTRODUCTION

Hyperparathyroidism is the third most common endocrine disorder encountered, which is primarily due to raised activity of Parathormone secreted by the Parathyroid gland. While several other hormones and organ systems also play a role in the biochemical picture of this entity, the final product of these intricate reactions is Hypercalcemia. However, the clinical picture of Hyperparathyroidism is a varied one, the spectrum of presentation spans from Occult, asymptomatic to Overt, significant - bone diseases like pathological fracture, osteopenia, osteoporosis.^[1] The wide array of symptoms also include derangement of various organ systems namely the renal, gastro-intestinal, bone, neuro-cognitive and musculoskeletal abnormalities. Each without a documented pattern of onset and percentage of distribution of symptoms and signs. Asymptomatic disease appears to be more common presentation than others, hence has a higher chance of being an under-recognised entity.^[2,3] Their management too differs accordingly and can encompass both medical and surgical treatment options; however for a long term and definitive treatment approach, surgical intervention remains the gold standard.^[4] The crux of this study was to pick up the pattern of patients who have presented to our institution, which may prove to be useful to screen and gather hyperparathyroid patients and offer them the best possible care, based on relevant information collected here. Moreover we are currently in the era of Minimal Access surgery for many ailments, we in this study aim to delineate the trends of surgical approach offered to the patients with hyperparathyroidism, based on which advanced interventions can be granted to patients. Surgeons' wisdom plays a huge part in deciding which protocol of treatment will benefit patients the best, from an array of different types of management modalities available; The same will affect the patient selection, choice of approach, use of intraoperative adjuncts. This method of relying on one's own wisdom is subject to inter observer bias. In this study we gathered information, which can be used to formulate a solid protocol for management of a patient presenting with hyperparathyroidism based on our experience and worldwide trends as well as recent advances, taking into account all the factors affecting the patient, the disease and the surgeon.

METHODOLOGY

This is a retrospective descriptive study, in which patients who were diagnosed with primary hyperparathyroidism in our institution were taken for a multivariate analysis. Data of patients who presented to the department of General Surgery, PSGIMSR - during the period of December 2014 to December 2020 were included in the study. Data of such patients were collected from ICD search from Medical records department, procedure search from Operation theatre database and Histopathology reports from HPE registry. Data from the above sources were

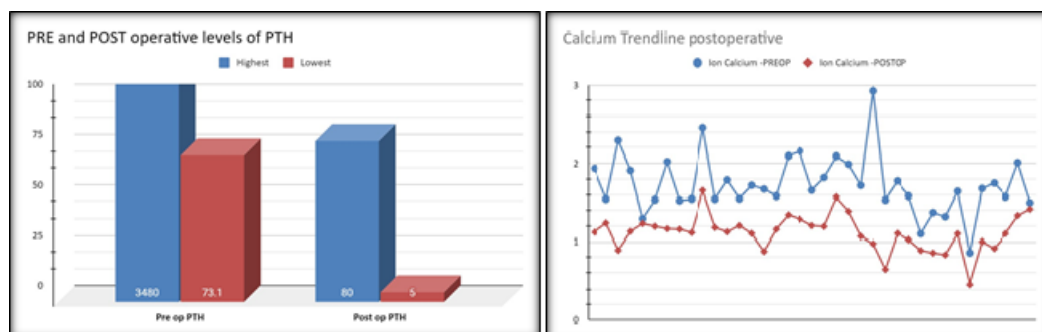
analysed and several variables were identified -Final Diagnosis, Duration of hospital stay, Presenting complaints, preoperative and postoperative laboratory parameters, type of Surgical procedure opted, Total operative duration, intra operative and postoperative complications, recurrence patterns, Preoperative and intraoperative localization, techniques for confirmation of excision and expenditure incurred by the patient. Data of patients diagnosed with primary hyperparathyroidism from December 2014 to December 2021 were retrieved from medical records. Demographics, preoperative investigations, operative details and follow up were studied.

RESULTS

Out of 37 patients identified, 29 underwent bilateral neck exploration by collar crease incision and 8 underwent Video assisted Parathyroidectomy. All of our patients were hailing from in and around southern India, with a median age of presentation at 41.38 ± 14 which was congruent with national average as per PHPT registry. Interestingly the gender distribution was at 0.9:1 - female to male ratio, which was drastically different from the national values of 2.4:1. The median duration of surgery averaged 120 minutes for minimally invasive procedures against a global average of 78 minutes, similarly bilateral neck explorations averaged at 180 minutes against 150 minutes, highlighting the need of high-volume centres, while the costs were substantially lower ranging from \$285-\$1821 against global expenditures of \$ 2693-\$ 4112. All but one patient had sestamibi scans done for preoperative localization, in almost all cases ultrasounds were done which yielded information on par with sestamibi. All variables mentioned above were analysed for any statistical correlation. T-test and Pearson Correlation method was used to analyse significance between concerning variables. All statistical compilations were performed using R software.

Table 1: Bilateral Neck Exploration Vs Minimally Invasive Procedure

				Duration of Stay		Total
				3 and below	more than 3	
Skin crease - NE	Count			4	25	29
	By percentage			13.8%	86.2%	
Video assisted	Count			1	7	8
	By percentage			12.5%	87.5%	
Total	Count			5	32	37
	% within Incision/Procedure			13.5%	86.5%	
Chi-Square Tests						
		Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square		.009 ^a	1	.925		
Continuity Correction ^b		.000	1	1.000		
Likelihood Ratio		.009	1	.924		
Fisher's Exact Test					1.000	.708
N of Valid Cases		37				
a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.08.						
b. Computed only for a 2x2 table						



DISCUSSION

Primary hyperparathyroidism is caused by autonomous inappropriate secretion of high PTH due to parathyroid hyperplasia or parathyroid adenoma causing raised serum calcium levels. The median age of presentation is 41.38 ± 14 , co-relating with the national average as per the PHPT registry. The sex distribution was 0.9:1 - female to male, indicating no specific gender dominance.^[5] The study included 37 patients with significant elevation in serum calcium levels and co-morbidities complicated due to the adenoma. Pre-Operative ⁹⁹Tc-Sestamibi scintigraphy and Ultrasound Neck were employed as per diagnostic criteria.^[6] USG neck was conducted in 28 patients, of which adenoma was localised in 27 patients. On the other hand, using a Sestamibi scan in 36 patients

showed the presence of adenomas in 35 patients, which consequently showed no significant sensitivity in localising the adenoma by using a Sestamibi scan over a USG neck in the conducted sample size.

Video-Assisted Parathyroidectomy was operated on 8 patients where a single localised adenoma was excised with multiple ports producing a reduced risk of RLN injury, reduced blood loss of 30ml on average, the reduced median duration of surgery averaging at 120 minutes, and a cosmetically more attractive scar. In addition, the classic approach with open surgery was performed in 29 patients who required bilateral neck exploration and was confirmed by frozen section. The median average duration of open surgery was 150 minutes, and the mean blood loss was 42.43 ml. The mean cost of all the surgeries performed was \$686.61, with \$630.50 for Video-Assisted Surgery and \$702.13 for open surgery, against global expenditures of range from \$ 2693-\$ 4112.^[7] Overall the mean duration of stay was 8.81 days. In addition, a significant reduction in hospital stay duration was noticed for Video-Assisted Surgery, with mean stay duration of 4.875 days in contrast to 11.038 days in open surgery. In the case of single adenoma parathyroidectomy, consequently, due to these factors, patient compliance is greater in Video-Assisted Parathyroidectomy than in open Parathyroidectomy.^[8]

Intraoperative localization of the parathyroid adenomas was done in a few patients using Intraoperative USG, Intraoperative FNAC to identify high PTH level along with the Surgeon's point of view, which is being commonly practised in our institution, followed by the confirmation of the excision through methods such as Intraoperative parathyroid hormone monitoring (IPM) and frozen section; these allow the adherence of Miami criterion stating ">50% intraoperative PTH drop in relations to pre-operative PTH levels" to be the end point of excision of gland.^[9] However, Postoperative complications such as tetany were seen in 11 patients, and persistent hypocalcemia in 9 patients indicated an overcorrection following the Miami criterion. Furthermore, developing a new standard that prevents overcorrection of serum calcium levels based on a correlation of the size of the adenoma to the amount of PTH secreted per mg may be required, which may also be accessible to centres without the adequate means to monitor rapid Intraoperative PTH levels and other high-end techniques.

CONCLUSION

Video-Assisted Parathyroidectomy appears to be a promising option for patients with a single localised adenoma, with reduced risk of injury, reduced blood loss, shorter duration of surgery, and a cosmetically more attractive scar. The reduced duration of hospital stay and improved patient compliance also suggest that this approach may be preferred by patients. Intraoperative localization of parathyroid adenomas using techniques such as Intraoperative USG, Intraoperative FNAC, and Intraoperative parathyroid hormone monitoring (IPM) is becoming more common in surgical practice. However, as per our observations, overcorrection of serum calcium levels can be a common postoperative complication, and developing new standards to prevent this may be necessary. Overall, our study provides valuable insights into the diagnosis and management of primary hyperparathyroidism and highlights the importance of individualised approaches to surgical management based on the patient's specific needs and the size and location of the adenoma. Though being a low volume center, surgeon dependent intraoperative localization of parathyroid adenoma without use of any adjuncts was adequate, highlighted by negligible persistence and recurrence rate.

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