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Original Article

Outcome of Surgery for Primary Hyperparathyroidism

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Abstract

Background: *A common endocrine condition with a range of clinical manifestations and outcomes is primary hyperparathyroidism. The purpose of this study was to assess the surgical results for primary hyperparathyroidism.*

Aim of the study: *The Aim of the study is to assess the outcome of surgery for primary hyperparathyroidism.*

Methods: *A prospective observational study was conducted in the Head and Neck Surgery Division of the Department of Otolaryngology-Head & Neck Surgery, BSMMU, Shahbag, Dhaka from August 2022 to January 2023. 35 patients underwent parathyroidectomy. The data was collected and analyzed using SPSS 26.0 (Statistical Package for the Social Science). The statistical significance was set to p<0.05.*

Result: *In this series, the majority of the patients (19, 54.29%) were in the 58 to 68 years age group. Among them, the majority (71.0%) of the patients were female. It was observed that the majority (54%) of the study subjects were symptomatic and 46% of the patients were asymptomatic.Here, 3 (8.5%), 6 (17.1%), and 2 (5.7%) patients presented with osteitis fibrosa cystica, nephrolithiasis, and neuropsychiatric syndrome respectively. Moreover, 14 (40.0%) patients had muscle weakness, and 18 (51.0%) subjects presented with fatigue. In this study, parathyroid adenoma was found in 85.75% and 74.90% of patients in symptomatic and asymptomatic patients respectively.The most affected site of the parathyroid gland was the right inferior lobe (13, 37.14%), followed by, the left inferior (31.42%), right superior (6, 17.14%), left superior (5, 14.28%).Preoperative PTH and calcium levels, and postoperative calcium levels in SPHPT and ASPHPT were found statistically significant. The majority of the patients (4, 11.42%) suffered from temporary hypocalcemia. A statistically significant increase in the Visual Analog Scale (VAS) score from 70 (interquartile range (IQR): 50-80) to 80 (IQR: 70-90) (P < 0.001).*

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Conclusion:*The long-term benefits of parathyroidectomy in patients with primary hyperparathyroidism (PHPT) are demonstrated by this prospective study. In the long run, these patients' lives appear to be significantly impacted by the noted decrease in pre-operative symptoms.*

Keywords:*Primary Hyperparathyroidism, Parathyroidectomy, Hypercalcemia, Surgical outcome.*

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Introduction

The endocrine condition known as primary hyperparathyroidism (PHPT) is common and has a prevalence of 0.1% to 1%. It is intimately linked to the aging process and has a noticeable tendency to impact women[1,2]. These days, primary hyper-parathyroidism (PHPT) is often discovered by chance when doing standard biochemical tests. PHPT is frequently classified as asymptomatic to differentiate it from more severe instances that have traditional bone, renal, and mental symptoms. Many people with relatively modest hypercalcemia may nevertheless have symptoms that could be related to PHPT even though they are classified as asymptomatic. It is unclear, therefore, how closely these symptoms correspond to biochemical indicators of severity and whether surgery may reverse them[3]. According to a recent study, a significant percentage of PHPT instances might not be identified. Only 31% of hypercalcemic individuals had their PTH levels evaluated, according to the study, suggesting that PHPT may not be fully recognized in clinical evaluations.[4]

The normo-calcemic type of PHPT has gained more recognition in recent years. It's important to remember that this element is outside the purview of our present inquiry[5]. In primary hyperparathyroidism, elevated parathyroid hormone levels increase the risk of fractures by demineralizing bones[6]. This illness also increases the risk of kidney and urinary tract stones because it is characterized by high calcium levels in the urine.The kidneys or other urinary system components may develop stones as a result of the crystals that are formed by the excess calcium in the urine[7]. Certain cardiovascular problems have been linked to elevated parathyroid hormone and calcium levels in primary hyper-parathyroidism. Some studies have found a link between primary hyper-parathyroidism and atherosclerosis, as well as an elevated risk of acute myocardial infarction, or heart attack[8,9]. There have been reports of arterial hypertension in primary hyperparathyroidism instances that do not improve with surgery. Acute and chronic pancreatitis episodes, as well as stomach and duodenal ulcers, are other possible outcomes for people with this illness.Primary hyperparathyroidism and these disorders are linked by complicated mechanisms that may include several physiological aspects associated with the increased levels of calcium and parathyroid hormone[10,11].

Three different phenotypes are included in the clinical representation of primary hyperparathyroidism (PHPT). These include moderate asymptomatic hypercalcemia, involvement of target organs impacting the skeletal and renal systems, and the more recent discovery of elevated PTH levels within dependably normal albumin-corrected and ionized serum calcium values. Several things

can cause certain phenotypes to be more common in a nation.The prevalence of a specific clinical presentation in a population can be influenced by the degree of biochemical screening, the significance of vitamin D deficiency, and the regular monitoring of PTH levels by healthcare facilities or professionals in the assessment of osteoporosis or low bone density. Comprehending these elements is essential for customizing diagnostic and treatment strategies to the unique traits and requirements of people with primary hyperparathyroidism[12]. Surgery has become an increasingly common treatment option for primary hyperparathyroidism in recent years.

The most frequent reason for surgery in this situation is now low bone mineral density rather than renal calculi. This change reflects a growing awareness of the illness and its symptoms, highlighting the significance of controlling consequences including kidney stones as well as bone health issues. Several variables, such as the degree of symptoms, calcium, and parathyroid hormone levels, and the existence of issues about bone health and other organs, are frequently taken into consideration when deciding whether to have surgery[13]. It is commonly known that surgical surgery is beneficial for people with symptomatic PHPT. Everyone agrees that patients who show the typical signs of hyperparathyroidism should have a parathyroidectomy. The aim of the current study is to assess the outcome of surgery for primary hyperparathyroidism.

Methods:

This prospective cross-sectional study was conducted from August 2022 to January 2023 in the Head and Neck Surgery division of the Department of Otolaryngology-Head & Neck Surgery and Endocrine Surgery at Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka. After receiving Institutional Review Board approval, 35 patients were diagnosed with primary, persistent, or recurrent hyperparathyroidism, who met inclusion criteria and underwent parathyroidectomy. Patients with secondary, tertiary, or familial hyperparathyroidism were excluded. Data were collected and Statistical analysis, including repetitive measures and descriptive statistics, was performed using SPSS 26.0, with a significance level of $p<0.05$.

Results:

Table I

Age distribution of the study subjects (N=35)

Age (years)	n=35	Percentage (%)
25-35	1	2.85
36-46	1	2.85
47-57	3	8.57
58-68	19	54.29
≥69	11	31.42
Mean ±SD	63.10± 15.50	

In this series, the majority of the patients (19, 54.29%) were in the 58 to 68 years age group, followed by, (11, 31.42%) were in e”69 years age group. [Table I]

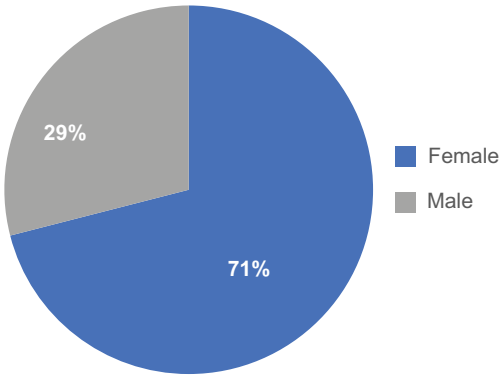

Figure 1: Sex distribution of the respondents
It was observed that the majority (71.0%) of the patients were female. [Figure 4.1]

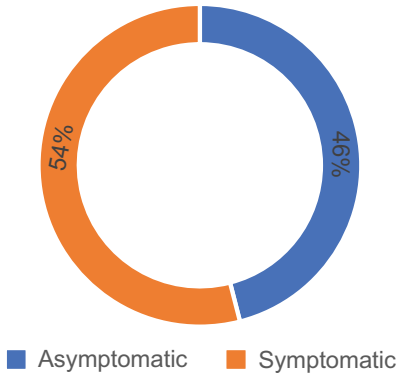

Figure 2: *Distribution of patients according to clinical presentation*

It was observed that the majority (54%) of the study subjects were symptomatic. 46% of the patients did not show clinical symptoms. [Figure 2].

In this series, 3 (8.5%), 6 (17.1%), and 2 (5.7%) patients presented with osteitis fibrosa cystica, nephrolithiasis, and neuropsychiatric syndrome respectively. Moreover, 14 (40.0%) patients had muscle weakness, and 18 (51.0%) subjects presented with fatigue. [Table II].

Table II

Distribution of patients according to classical and non-classical manifestations of PHPT (N=35)

Symptoms	n=35	Percentage (%)
Classical		
Osteitis fibrosa cystica	3	8.5
Nephrolithiasis	6	17.1
Neuropsychiatric syndrome	2	5.7
Non-classical		
Muscle weakness	14	40
Fatigue	18	51

In this study, parathyroid adenoma was found in 85.75% and 74.28% of patients in symptomatic and asymptomatic patients respectively. Other pathologies were parathyroid hyperplasia, parathyroid carcinoma, and parathyroid adenoma with hyperplasia [Table III].

In this series, the most affected site was right inferior (13, 37.14%), followed by, left inferior (31.42%), right superior (6, 17.14%), and left superior (5, 14.28%) [Table IV].

Table III

Distribution of patients according to type of pathology (N=35)

Pathological type	Symptomatic PHPT n(%)	Asymptomatic PHPT n(%)
Parathyroid adenoma	30 (85.75)	26 (74.28)
Parathyroid hyperplasia	3 (8.57)	7 (20.00)
Parathyroid carcinoma	0 (0.00)	1 (2.85)
Parathyroid adenoma with hyperplasia	1 (2.85)	1 (2.85)

Table IV

Site of parathyroid glands involved (N=35)

Site	n=35	Percentage %	p-value
Right inferior	13	37.14%	
Right superior	6	17.14%	< 0.01
Left inferior	11	31.42%	
Left superior	5	14.28%	

Table V

Preoperative and postoperative levels of serum calcium and PTH (N=35)

Levels	SPHPT	ASPHPT	p-value
Preoperative PTH (uIU/ml) ± SD	1110.70±1058.10	435.98 ± 396.14	< 0.01
Postoperative PTH(uIU/ml) ± SD	31.94 ± 47.55	63.48 ± 192.00	0.031
Preoperative Ca (mmol/L) ± SD	3.12 ± 0.51	2.80 ± 0.38	< 0.01
Postoperative Ca(mmol/L) ± SD	2.42 ± 0.39	2.31 ± 0.23	< 0.01

SPHPT; Symptomatic Primary Hyperparathyroidism, ASPHPT; Asymptomatic Primary Hyperparathyroidism

It was observed that preoperative PTH and calcium levels, and postoperative calcium levels in SPHPT and ASPHPT were statistically significant. [Table V].

In this study, the majority of the patients (4, 11.42%) suffered from temporary hypocalcemia. Other complications of parathyroidectomy were RLN (Recurrent laryngeal nerve) palsy (3, 8.57%), postoperative hemorrhage (2, 5.71%), infection (1, 2.85%), recurrent hyper-parathyroidism (1, 2.85%), and persistent hyperparathyroidism (1, 2.85%). [Table VI].

A positive shift in health-related quality of life was noted globally, as evidenced by a statistically significant increase in the Visual Analog Scale (VAS) score from 70 (interquartile range (IQR): 50-80) to 80 (IQR: 70-90) ($P < 0.001$). Specifically, asymptomatic patients experienced a noteworthy improvement in VAS scores, rising from 77 to 85. This improvement extended across all five domains of quality of life. Furthermore, even the symptomatic group demonstrated a significant enhancement in their VAS scores, suggesting an overall positive impact on their health-related quality of life. [Table 7]

Table VI

Distribution of patients according to complications of parathyroidectomy (N=35)

Complications	n=35	Percentage
		%
Hemorrhage	2	5.71
RLN palsy	3	8.57
Infection	1	2.85
Temporary hypocalcemia	4	11.42
Recurrent hyperparathyroidism	1	2.85
Persistent hyperparathyroidism	1	2.85

Table VII

Health-related quality of life in patients with PHPT before and after surgery (N=35)

Parathyroidectomy	VAS score		p-value
	Asymptomatic patients	Symptomatic patients	
Before parathyroidectomy	77	70	<0.01[s]
After parathyroidectomy	85	72	

Discussion:

Parathyroidectomy (PTX) is the treatment of choice for symptomatic primary hyperparathyroidism (PHPT). This study intended to assess the surgical outcome of parathyroidectomy in PHPT[14]. In this series, the majority of the patients (19, 54.29%) were in the 58 to 68 years age group, followed by, (11, 31.42%) were in ≥69 years age group. It was observed that the majority (71.0%) of the patients were female. In a study by Miller, B.S. et al. peak incidence was at age 56–60 years with 61–65 in females and age 56–60 in males[15]. However, the mean age was 41 ± 14 years with a female: male ratio of 2.4:1 according to a study by Bhadada, S.K et al. 2018[16]. Shah, V.N. et al. also showed a female preponderance in their study which was similar to the present study[17]. It was observed that the majority (54%) of the study subjects were symptomatic. 46% of the patients did not show clinical symptoms.In the study of Arya, A.K., et al., of the 554 patients, 54 (10%) patients had asymptomatic PHPT[18]. Regarding the clinical features, 3 (8.5%), 6 (17.1%), and 2 (5.7%) patients presented with osteitis fibrosa cystica, nephrolithiasis, and neuropsychiatric syndrome respectively. Moreover, 14 (40.0%) patients had muscle weakness, and 18 (51.0%) subjects presented with fatigue. These features were found similar to multiple studies[19-21]. In this study, parathyroid adenoma was found in 85.75% and 74.90% of patients in symptomatic and asymptomatic patients respectively.

Other pathologies were parathyroid hyperplasia, parathyroid carcinoma, and parathyroid adenoma with hyperplasia. In this series, the most affected site of the parathyroid gland was the right inferior lobe (13, 37.14%), followed by, the left inferior (31.42%), right superior (6, 17.14%), left superior (5, 14.28%). In the study of LoPinto, M., et al, among 810 patients who underwent PTX for PHPT, single abnormal parathyroid glands were unequally distributed among the four eutopic locations (left superior, 15.7%; left inferior, 31.3%; right superior, 15.8%; right inferior, 37.2%; $P < 0.01$), which was similar to the present study[22]. It was observed that preoperative PTH and calcium levels, and postoperative calcium levels in SPHPT and ASPHPT were statistically significant in the present study. The preoperative and postoperative biochemical values were similar to the study of Yu, Q. et al[23]. Concerning the complications of the PTx (Parathy-roidectomy), the majority of the patients (4, 11.42%) suffered from temporary hypocalcemia. Other complications of parathy- roidectomy were RLN (Recurrent laryngeal nerve) palsy (3, 8.57%), postoperative hemorrhage (2, 5.71%), infection (1, 2.85%), recurrent hyper-parathyroidism (1, 2.85%), and persistent hyperparathyroidism (1, 2.85%) in this study. Zanocco, K.A. et al. found the probability of recurrent laryngeal nerve injury was <12.5% which was similar to the present study[24].

The cure rate of PHPT was 96.63% in the study of Yu Q et al. Moreover, they also observed that the recurrence rate of PHPT was 1.12%, and the incidence of temporary hypocalcemia was 13.48%, which was somewhat similar to the study of Yu Q et al.[23] A positive shift in health-related quality of life was noted globally, as evidenced by a statistically significant increase in the Visual Analog Scale (VAS) score from 70 (interquartile range (IQR): 50-80) to 80 (IQR: 70-90) (P < 0.001).Specifically, asymptomatic patients experienced a noteworthy improvement in VAS scores, rising from 77 to 85. This improvement extended across all five domains of quality of life.Furthermore, even the symptomatic group demonstrated a

significant enhancement in their VAS scores, suggesting an overall positive impact on their health-related quality of life and coincides with the findings of Vadhwana, B. et al.[25] These findings underscore the effectiveness of the treatment in patients.

Conclusion:

The long-term benefits of parathyroidectomy in patients with primary hyperparathyroidism (PHPT) are demonstrated by this prospective study. In the long run, these patients' lives appear to be significantly impacted by the noted decrease in pre-operative symptoms.

References:

1. Bilezikian JP, Bandeira L, Khan A. and Cusano NE. Hyperparathyroidism. *The Lancet*, 2018; *391*(10116), pp.168-178.
2. Yeh MW, Ituarte PH, Zhou HC, Nishimoto S, Amy Liu IL, Harari A, Haigh PI and Adams AL. Incidence and prevalence of primary hyperpara-thyroidism in a racially mixed population. *The Journal of Clinical Endocrinology & Metabolism*. 2013; *98*(3), pp.1122-1129.
3. Silverberg SJ, Clarke BL, Peacock M, Bandeira F, Boutros S, Cusano NE, Dempster D, Lewiecki EM, Liu JM, Minisola S. and Rejnmark L. Current issues in the presentation of asymptomatic primary hyper-parathyroidism: proceedings of the Fourth International Workshop. *The Journal of Clinical Endocrinology & Metabolism*, 2014; *99*(10), pp.3580-3594.
4. Balentine CJ, Xie, R, Kirklin, JK. and Chen H. Failure to diagnose hyperparathyroidism in 10,432 patients with hypercalcemia: opportunities for system-level intervention to increase surgical referrals and cure. *Annals of surgery*, 2017; *266*(4), p.632.
5. Khan AA, Hanley DA, Rizzoli R, Bollerslev J, Young JEM, Rejnmark L, Thakker R, D'amour, P, Paul T, Van Uum S. and Shrayyef MZ. Primary hyperparathyroidism: review and recommendations on evaluation, diagnosis, and management. A Canadian and international consensus. *Osteoporosis International*, 2017; *28*: pp.1-19.
6. Vestergaard P, Mollerup CL, Frøkjær VG, Christiansen P, Blichert-Toft M. and Mosekilde, L. A cohort study of the risk of fracture before and after surgery for primary hyperpara-thyroidism. *Bmj*, 2000; *321*(7261): pp.598-602.
7. Mollerup CL, Vestergaard P, Frøkjær VG, Mosekilde L, Christiansen P. and Blichert-Toft M. Risk of renal stone events in primary hyperparathyroidism before and after parathyroid surgery: controlled retrospective follow up study. *Bmj*, 2002; *325*(7368), p.807.
8. Roberts WC and Waller BF. Effect of chronic hypercalcemia on the heart. An analysis of 18 necropsy patients. *The American Journal of Medicine*, 1981; *71*(3), pp.371-384.
9. Palmér M, Adami HO, Bergström R, Åkerström G. and Ljunghall, S. Mortality after surgery for primary hyper-parathyroidism: a follow-up of 441 patients operated on from 1956 to 1979. *Surgery*, 1987; *102*(1): pp.1-7.
10. Sancho JJ, Rouco J, Riera-Vidal R. and Sitges-Serra A. Long-term effects of parathyroidectomy for primary hyperparathyroidism on arterial hypertension. *World Journal of Surgery*, 1992; *16*: pp.732-735.
11. Paloyan D., Simonowitz D, Paloyan E. and Snyder TJ. Pancreatitis associated with primary hyperparathyroidism. *The American Surgeon*, 1982; *48*(8): pp.366-368.

12. Silva BC, Cusano NE and Bilezikian JP. Primary hyperparathyroidism. *Best practice & research Clinical endocrinology & metabolism*, 2018; *32*(5): pp.593-607.

13. Delbridge LW, Younes NA, Guinea AI, Reeve TS, Clifton Bligh P. and Robinson BG. Surgery for primary hyper parathyroidism 1962 1996: indications and outcomes. *Medical Journal of Australia*, 1998; *168*(4), pp.153-156.

14. Perrier N, Lang BH, Farias LCB, Poch LL, Sywak M., Almquist M, Vriens MR, Yeh MW, Shariq O, Duh QY and Yeh R. Surgical aspects of primary hyperparathyroidism. *Journal of Bone and Mineral Research*, 2022; *37*(11): pp.2373-2390.

15. Miller BS, Dimick J, Wainess R. and Burney RE. Age-and sex-related incidence of surgically treated primary hyperparathyroidism. *World Journal of Surgery*, 2008; *32*: pp.795-799.

16. Bhadada SK, Arya AK, Mukhopadhyay S, Khadgawat R, Sukumar S, Lodha S, Singh DN, Sathya A, Singh P and Bhansali A. Primary hyperparathyroidism: insights from the Indian PHPT registry. *Journal of Bone and Mineral Metabolism*, 2018; *36*, pp.238-245.

17. Shah, VN, Bhadada SK, Bhansali A, Behera A, Mittal BR and Bhavin V. Influence of age and gender on presentation of symptomatic primary hyperparathyroidism. *Journal of Postgraduate Medicine*, 2012; *58*(2), p.107.

18. Arya AK, Kumari P, Bhadada SK, Agrawal K, Singh P, Mukherjee S, Sood A. and Rao SD. Progressive rise in the prevalence of asymptomatic primary hyperparathyroidism in India: Data from PHPT registry. *Journal of Bone and Mineral Metabolism*, 2021; *39*, pp.253-259.

19. El Hajj Fuleihan G, Chakhtoura M, Cipriani C, Eastell R, Karonova T, Liu JM, Minisola S, Mithal A, Moreira CA, Peacock M. and Schini M. Classical and nonclassical manifestations of primary hyperparathyroidism. *Journal of Bone and Mineral Research*, 2022; *37*(11), pp.2330-2350

20. Chiodini I, Cairoli E, Palmieri S, Pepe J. and Walker MD. Non-classical complications of primary hyper-parathyroidism. *Best Practice & Research Clinical Endocrinology & Metabolism*, 2018; *32*(6), pp.805-820.

21. Saponaro F, Cetani F, Repaci A, Pagotto U, Cipriani C, Pepe J, Minisola S, Cipri C, Vescini, F, Scillitani A. and Salcuni A. Clinical presentation and management of patients with primary hyperparathyroidism in Italy. *Journal of Endocrinological Investigation*, 2018; *41*, pp.1339-1348.

22. LoPinto M, Rubio GA, Khan ZF, Vaghaiwalla TM, Farra JC. and Lew JI. Location of abnormal parathyroid glands: lessons from 810 parathyroidect-omies. *journal of surgical research*, 2017; *207*, pp.22-26.

23. Yu Q, Liu K, Ma D, Xie C, Wu Y, Dai W. and Jiang H. Do symptoms and serum calcium levels affect the results of surgical treatment of primary hyperparathyroidism? *BioMed Research International*, *2019*.

24. Zanocco KA, Wu JX and Yeh MW. Parathyroidectomy for asymptomatic primary hyperparathyroidism: a revised cost-effectiveness analysis incorporating fracture risk reduction. *Surgery*, 2017; *161*(1), pp.16-24.

25. Vadhwana B, Currow C, Bowers D. and Groot-Wassink, T. Impact on quality of life after parathyroidectomy for asymptomatic primary hyperpara-thyroidism. *Journal of Surgical Research*. 2021; *261*, pp.139-145.