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Quality of life among primary hyperparathyroidism patients with recurrent renal stone disease: A comparative analysis of surgical and non-surgical management groups

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Abstract

Introduction: Renal stone disease (nephrolithiasis) is a common condition linked to significant morbidity, with primary hyperparathyroidism (PHPT) identified as a key contributor in recurrent cases. While parathyroidectomy remains the gold-standard treatment, the comparative impact of surgical and non-surgical approaches on quality of life (QoL) remains inadequately explored.

Objectives: To evaluate the impact of parathyroidectomy on QoL and compare the effectiveness of surgical and non-surgical management in enhancing physical, emotional, and social well-being among patients with PHPT and recurrent renal stone disease.

Patients and Methods: This cross-sectional study included 84 participants diagnosed with PHPT and recurrent renal stones, recruited from private hospitals in Jordan. Participants were divided into two groups: post-parathyroidectomy (n=46) and non-surgical (n=38). Quality of life was assessed using the short form health survey (SF-36), focusing on eight health domains. Data were collected online and analyzed using SPSS (version 27). Independent T-test was conducted to compare QoL outcomes between the groups, with statistical significance set at $p < 0.05$.

Results: Post-parathyroidectomy patients reported significantly higher QoL scores in physical functioning (mean: 4.80 versus 3.45, $P < 0.05$), bodily pain (4.89 versus 3.32, $P < 0.05$), and general health perceptions (4.70 versus 3.26, $P < 0.05$). The total QoL score was significantly greater in the surgical group (mean: 36.91 versus 27.08, $P < 0.05$). However, no significant differences were observed in social functioning, mental health, or role-emotional functioning between the two groups.

Conclusion: Parathyroidectomy significantly improves physical functioning, pain reduction, and overall health perceptions in patients with PHPT and recurrent renal stones. However, emotional and social domains remain similar to non-surgical management, indicating the need for integrated psychosocial support alongside physiological interventions to optimize QoL.

Keywords: Primary hyperparathyroidism, Parathyroidectomy, Renal stones, Quality of Life, Chronic disease management

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Introduction

Renal stone disease, or nephrolithiasis, is a prevalent condition associated with significant morbidity and healthcare costs. While its etiology is multifactorial, primary hyperparathyroidism (PHPT) is a well-documented contributor, particularly in patients with recurrent stone formation. PHPT, characterized by elevated serum calcium and parathyroid hormone levels, often precipitates hypercalciuria, a key risk factor for renal stone recurrence (1).

Parathyroidectomy, the surgical removal of one or

more hyperfunctioning parathyroid glands, remains the definitive treatment for PHPT. It has shown efficacy in normalizing serum calcium levels, reversing hypercalciuria, and potentially reducing the recurrence of nephrolithiasis. In contrast, non-surgical management strategies, such as pharmacological interventions and lifestyle modifications, are often employed in patients who are either ineligible for surgery or have chosen not to undergo surgery for conservative treatment. Despite these options, the comparative effectiveness of these approaches in improving patient outcomes, including quality of life

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■ Implication for health policy/practice/research/medical education

Health Policy: The study emphasizes the importance of recognizing parathyroidectomy as a cost-effective intervention to improve quality of life (QoL) in patients with recurrent renal stone disease due to primary hyperparathyroidism (PHPT). Policymakers should consider integrating surgical options as a priority in treatment guidelines for PHPT, while ensuring equitable access to surgery for eligible patients. Additionally, incorporating psychosocial care into reimbursement models could enhance holistic patient outcomes.

Clinical Practice: Healthcare providers should prioritize parathyroidectomy for eligible PHPT patients to address the physical and general health challenges associated with recurrent nephrolithiasis. Simultaneously, practitioners should adopt a multidisciplinary approach, including psychosocial support services, to address the unmet emotional and social needs highlighted by the study.

Research: This study identifies a critical gap in addressing the psychosocial dimensions of QoL in PHPT patients. Future research should explore interventions that integrate psychosocial care with surgical and conservative treatments. Longitudinal studies are also needed to assess the long-term benefits of parathyroidectomy on QoL and recurrence rates compared to non-surgical management.

Medical Education: Medical curricula should emphasize the importance of comprehensive QoL assessments in managing chronic conditions like recurrent renal stone disease. Training programs should focus on developing skills for holistic patient care, including the use of validated QoL measurement tools and strategies to address both physiological and psychosocial health dimensions.

(QoL), remains inadequately studied (2).

The QoL for patients with recurrent renal stone disease extends beyond physical symptoms to encompass psychological and social dimensions. The chronic nature of the condition, coupled with frequent hospitalizations, invasive procedures, and ongoing risk of recurrence, imposes a substantial burden. Studies suggest that successful management of the underlying cause, such as PHPT, may have a transformative effect on QoL. However, there is limited evidence comparing QoL outcomes between surgical and non-surgical management in this patient population (3).

Recent advances in surgical techniques, including minimally invasive parathyroidectomy, have further reduced the risks and recovery times associated with the procedure. These advancements have made surgery a viable option for a broader patient demographic, including those with comorbidities previously deemed high-risk. Despite this progress, there remains uncertainty about the long-term benefits of parathyroidectomy on renal stone recurrence and QoL, particularly when compared to conservative approaches (4).

The complexity of PHPT-related nephrolithiasis warrants a multidisciplinary approach to treatment. Factors such as patient age, comorbidities, stone burden, and biochemical profile influence the choice of management strategy. While observational studies and clinical trials have highlighted the effectiveness of surgical

treatment in achieving biochemical remission, their scope often excludes detailed analyses of QoL metrics, leaving a critical gap in the literature (4,5).

A comparative analysis of surgical versus non-surgical interventions for PHPT-associated recurrent renal stones offers an opportunity to address this gap. Such research can provide valuable insights into the role of parathyroidectomy in not only reducing stone recurrence but also enhancing overall patient well-being. Furthermore, it can aid clinicians in tailoring treatment plans that align with patient preferences and optimize outcomes (5, 6).

QoL assessment tools, including validated instruments such as the Short Form Health Survey (SF-36) and disease-specific questionnaires, have emerged as essential components of outcome evaluation. By incorporating these measures into comparative studies, researchers can capture the nuanced effects of treatment modalities on physical, emotional, and social health. Despite their utility, these tools remain underutilized in nephrolithiasis research, underscoring the need for a paradigm shift in outcome measurement (7,8).

The psychosocial impact of recurrent renal stones, particularly in patients with untreated PHPT, is an often-overlooked aspect of disease management. Chronic pain, anxiety about recurrence, and the financial burden of repeated interventions can severely compromise QoL. Surgical resolution of the underlying hyperparathyroidism may alleviate these challenges, but empirical evidence substantiating this hypothesis remains scarce (5,6).

Given the variability in patient responses to surgical and non-surgical treatments, a comparative approach is essential for elucidating the determinants of successful outcomes. Factors such as baseline biochemical parameters, stone composition, and patient-reported outcomes must be systematically evaluated to provide a comprehensive understanding of the benefits and limitations of each management strategy (6,7).

Objectives

To evaluate the impact of parathyroidectomy on QoL and compare the effectiveness of surgical and non-surgical management in enhancing physical, emotional, and social well-being among patients with PHPT and recurrent renal stone disease.

Patients and Methods

Study design

This study employed a comparative, cross-sectional design to evaluate the impact of primary parathyroidectomy on the QoL in patients with recurrent renal stone disease. The research compared outcomes between patients undergoing surgical (parathyroidectomy) and non-surgical management for PHPT.

This study was conducted in private hospitals and clinics across Jordan. These healthcare facilities were chosen

to ensure access to a diverse population of patients with recurrent renal stones, representing both surgical and non-surgical treatment pathways.

Sample size

A total of 84 participants were included in the study. The sample comprised adults diagnosed with recurrent renal stone disease and PHPT, with 46 participants in the surgical group and 38 in the non-surgical group. Participants were recruited using purposive sampling to ensure they met the inclusion criteria, including a confirmed diagnosis and willingness to participate in the study.

Instrument

The SF-36 was conducted as the primary instrument for assessing QoL. This validated tool measures eight dimensions of health, including physical functioning, bodily pain, general health perceptions, vitality, social functioning, and emotional well-being (6). The SF-36 has been extensively used in studies of patients with chronic conditions and is sensitive to changes in QoL resulting from medical interventions (7). SF-36 survey uses a 1–6 Likert scale (6,7).

Data collection

Data collection was conducted online through secure and encrypted survey platforms. Participants were provided with a link to the survey after obtaining informed consent. Demographic data, clinical history, and SF-36 responses were collected as part of the online questionnaire.

Data analysis

Data were analyzed using IBM SPSS Statistics software (version 27). Descriptive statistics were used to summarize demographic and clinical characteristics. Independent sample T-test was conducted to compare QoL scores between the surgical and non-surgical groups. Pearson's correlation analysis explored associations between QoL scores and key clinical variables. Statistical significance was set at $P < 0.05$.

Results

The demographic characteristics of the study population are summarized in [Table 1](#). The distribution of participants based on age range shows that the majority (30%) were aged between 56-65 years, followed by 23% in the 36-45 age group. A significant proportion of participants (22%) were in the 66-75 age range, while the age groups 25-35 and 46-55 each accounted for 13% of the sample.

Gender distribution was relatively balanced, with 54% of participants being male and 49% female. This suggests a nearly equal representation of both genders in the study, ensuring diverse perspectives. Regarding educational attainment, 37% of participants held postgraduate degrees, making this the most represented educational category. This was followed by 34% who had completed

Table 1. Demographic characteristics

Variable	Sub-variable	Number	Percent
Age range (y)	25-35	11	13
	36-45	19	23
	46-55	11	13
	56-65	25	30
	66-75	18	22
Gender	Female	40	49
	Male	44	54
Educational degree	Postgraduate	30	37
	Undergraduate	26	32
	High School	28	34
Performed parathyroidectomy	Yes	46	56
	No	38	46

high school and 32% with undergraduate degrees. The diversity in educational backgrounds reflects a broad spectrum of societal representation. In terms of treatment, 56% of participants had undergone parathyroidectomy, while 46% had not. This balance between the two groups provides a robust basis for comparing the outcomes of surgical and non-surgical interventions in the study. The quality-of-life scores for the total patient population reflect moderate levels of functioning and well-being across physical, emotional, and social domains ([Table 2](#)).

Physical functioning (mean: 4.19, standard deviation [SD]: 1.83) and general health perceptions (mean: 4.05, SD: 1.88) suggest moderate physical abilities and health satisfaction, though bodily pain (mean: 4.18, SD: 1.77) remains a prominent concern. Social functioning (mean: 3.43, SD: 1.73) and mental health (mean: 3.61, SD: 1.71) indicate moderate challenges with interpersonal interactions and emotional well-being, including anxiety or depression. The overall QoL score (mean: 32.46, SD: 6.89) highlights a moderate QoL, with high variability among patients, emphasizing the need for targeted interventions to address both physical and emotional aspects of their well-being ([Figure 1](#)).

The comparison of quality-of-life scores between post-parathyroidectomy and non-surgical patients demonstrates significant advantages for the surgical group in several domains. Post-parathyroidectomy patients exhibited markedly better physical functioning (mean: 4.80, SD: 1.80 versus 3.45, SD: 1.59), less bodily pain (mean: 4.89, SD: 1.68 versus 3.32, SD: 1.49), and more favorable general health perceptions (mean: 4.70, SD: 1.62 versus 3.26, SD: 1.90), indicating substantial physical and health-related benefits. Other domains, such as vitality, social functioning, and role emotional functioning, showed smaller differences, while mental health scores were similar between the groups. Crucially, the total QoL score was significantly higher for post-parathyroidectomy patients (mean: 36.91, SD: 4.71 versus 27.08, SD: 5.02), highlighting the overall improvement in well-being

Table 2. Comparison of quality-of-life scores between total patients, post-parathyroidectomy patients, and non-surgical patients

Domain	Total Patients		Post parathyroidectomy patients		Non-surgical patients		T test	P value
	Mean	SD	Mean	SD	Mean	SD		
Physical functioning (PF)	4.19	1.83	4.80	1.80	3.45	1.59	3.63	< 0.05
Role physical functioning (RP)	3.13	1.64	2.93	1.64	3.37	1.63	-1.21	0.23
Body pain (BP)	4.18	1.77	4.89	1.68	3.32	1.49	4.51	< 0.05
General health perceptions (GH)	4.05	1.88	4.70	1.62	3.26	1.90	3.73	< 0.05
Vitality (VT)	3.46	1.81	3.65	1.86	3.24	1.75	1.05	0.30
Social functioning (SF)	3.43	1.73	3.48	1.86	3.37	1.58	0.29	0.77
Role emotional functioning (RE)	3.68	1.80	3.89	1.90	3.42	1.67	1.19	0.24
Mental health (MH)	3.61	1.71	3.57	1.89	3.66	1.48	-0.25	0.81
Total domain score	32.46	6.89	36.91	4.71	27.08	5.02	1.72	< 0.05

following surgery. These findings emphasize the potential of parathyroidectomy to enhance physical health and overall QoL in patients with recurrent renal stone disease (Figure 2).

The comparison of QoL scores between post-parathyroidectomy and non-surgical patients highlights

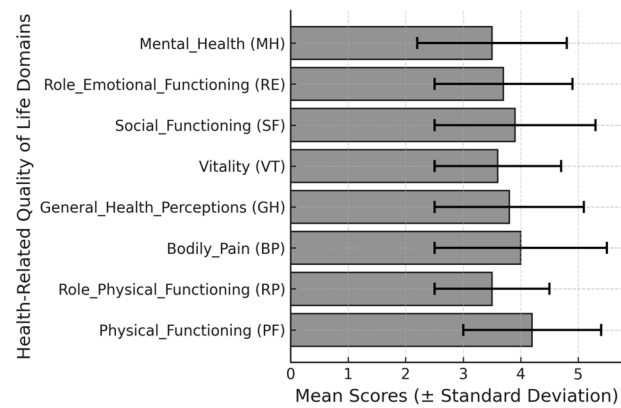


Figure 1. Quality of life domains for total patients.

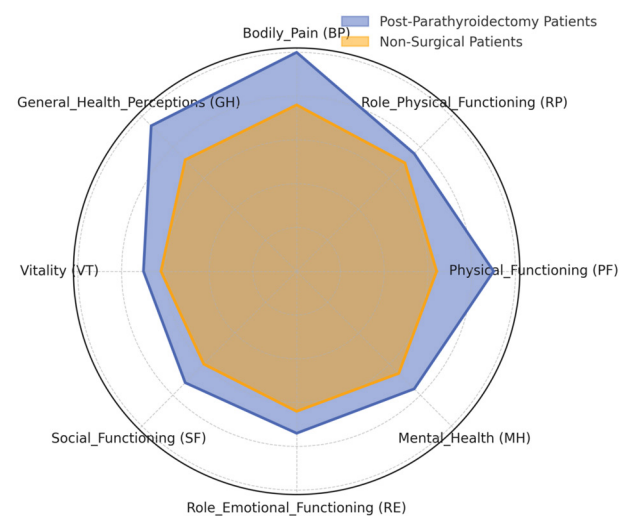


Figure 2. Radar chart quality of life domain comparison.

significant improvements in physical domains for the surgical group. Post-parathyroidectomy patients demonstrated better physical functioning ($t=3.63$, $P<0.05$; independent sample T-test), reduced bodily pain ($t=4.51$, $P<0.05$), and higher general health perceptions ($t=3.73$, $P<0.05$; independent sample T-test), indicating substantial physical and health-related benefits. The total QoL score was also significantly greater in the surgical group ($t=1.72$, $P<0.05$; independent sample T-test), underscoring the overall advantage of surgical intervention in improving patients' well-being (Table 2). However, other domains, including role physical functioning, vitality, social functioning, role emotional functioning, and mental health, did not show statistically significant differences between the groups, with t-test values ranging from -1.21 to 1.05 and P values above 0.23. These results suggest that while parathyroidectomy offers significant improvements in physical health and overall QoL, its impact on emotional and social aspects is less pronounced or similar to non-surgical management. This underscores the importance of further research into additional interventions that can comprehensively address all dimensions of QoL.

Table 3 presents the differences in total domain scores based on age range, gender, and educational degree, along with their statistical significance. The total domain scores varied slightly across age groups, with the highest mean scores observed in the 56-65 age group (mean: 38.08, SD: 5.38) and the 66-75 age group (mean: 38.00, SD: 4.94). However, the differences were not statistically significant ($F = 0.64$, $P=0.64$). Similarly, gender did not significantly influence total scores, with males scoring a mean of 36.73 (SD: 5.50) and females scoring slightly higher at 37.08 (SD: 3.98; $F = 0.06$, $P=0.80$). Regarding educational attainment, postgraduate participants had the highest mean score (mean: 38.29, SD: 6.58), followed by undergraduates (mean: 36.35, SD: 3.77) and high school graduates (mean: 36.27, SD: 3.49), but these differences were also not statistically significant ($F = 0.85$, $P=0.43$). Overall, no significant variations were found in total

Table 3. Differences in total domain score by age range, gender, and educational degree with statistical significance

Variable	Sub-variable	Mean total score	Standard deviation	F-Statistic	P value
Age range (y)	25-35	36.50	4.44	0.64	0.64
	36-45	35.60	3.66		
	46-55	35.50	5.36		
	56-65	38.08	5.38		
	66-75	38.00	4.94		
Gender	Male	36.73	5.50	0.06	0.80
	Female	37.08	3.98		
Educational degree	High school	36.27	3.49	0.85	0.43
	Postgraduate	38.29	6.58		
	Undergraduate	36.35	3.77		

domain scores across the examined demographic and educational variables.

Discussion

This study highlights the significant impact of primary parathyroidectomy on improving the QoL in patients with recurrent renal stone disease, emphasizing the surgical intervention's benefits on physical health and overall well-being. The findings demonstrate that post-parathyroidectomy patients experience noticeable improvements in physical functioning, reduced pain, and enhanced perceptions of general health. These outcomes align with the physiological effects of resolving hyperparathyroidism, including normalization of serum calcium levels and a reduction in stone recurrence, which can substantially alleviate the physical burden of the disease (1,2).

The alleviation of bodily pain observed in surgical patients is particularly significant, as chronic pain is a major factor affecting the daily lives of individuals with recurrent nephrolithiasis. By addressing the underlying hyperparathyroidism, parathyroidectomy reduces the frequency and severity of stone episodes, thus mitigating pain and its associated limitations (1,4). Additionally, improvements in general health perceptions suggest that patients perceive themselves as healthier overall after surgical treatment, further reinforcing the procedure's positive impact on their physical and mental outlook (8,9).

However, the study also reveals that parathyroidectomy does not significantly influence all dimensions of QoL. Emotional and social aspects, such as role functioning and mental health, were comparable between surgical and non-surgical patients. This finding suggests that while surgery effectively addresses the physiological contributors to nephrolithiasis, it does not fully resolve the psychosocial challenges associated with the condition (2,3). Factors such as the anxiety of stone recurrence, chronic stress, and lifestyle disruptions likely persist despite surgical intervention (4,5).

The limited impact of parathyroidectomy on emotional and social domains highlights the need for a more

holistic approach to managing recurrent renal stone disease. Psychosocial support, including counseling, stress management programs, and patient education, could be crucial in addressing these unmet needs. Such interventions may help patients to better cope with the long-term emotional and social challenges of their condition, complementing the physical improvements achieved through surgery (3,6).

Interestingly, non-surgical management also demonstrated a comparable influence on psychosocial domains. This suggests that conservative approaches, such as pharmacological treatments and lifestyle modifications, may offer similar benefits in reducing emotional and social distress. However, these strategies may lack the definitive physiological improvements provided by surgery, which directly addresses the underlying biochemical abnormalities of PHPT (6,7).

The absence of significant differences in QoL across demographic factors such as age, gender, and educational attainment further emphasizes the broad applicability of parathyroidectomy as a treatment option. Patients of varying backgrounds and characteristics appear to benefit similarly from the procedure, suggesting that it can be an effective intervention across diverse populations (5,8).

The study also underscores the importance of using validated QoL assessment tools, such as the SF-36, to capture the multifaceted impact of treatment. These tools provide insights into both the physical and psychosocial dimensions of health, enabling a comprehensive evaluation of patient outcomes. However, their findings highlight the need to incorporate additional measures that focus on emotional and social well-being, which are often underexplored in nephrolithiasis research (6,9).

The findings highlight a critical gap in the current treatment paradigm: the lack of integrated care models that address both the physiological and psychosocial aspects of recurrent renal stone disease. Future research should explore interventions that combine surgical or medical management with targeted psychosocial support, aiming to enhance overall QoL outcomes for patients (2,3).

Conclusion

Parathyroidectomy offers significant benefits in improving physical functioning and general health in patients with recurrent renal stone disease. However, its limited impact on psychosocial domains underscores the need for a more holistic approach to treatment. Combining surgical or medical management with psychosocial interventions may provide a more comprehensive strategy to address the multifaceted challenges faced by these patients. This integrated approach could help optimize patient outcomes, improve QoL, and reduce the overall burden of recurrent nephrolithiasis.

Limitations of the study

The study's cross-sectional design limits the ability to establish causality between parathyroidectomy and improvements in QoL. Longitudinal studies would provide better insights into the temporal effects of surgical and non-surgical interventions. The relatively small sample size (n=84) may limit the generalizability of the findings. Larger, more diverse cohorts are needed to confirm the results across different populations and healthcare settings. QoL was assessed using the SF-36, which relies on self-reported data. This may introduce response bias, as patients might overestimate or underestimate their QoL due to subjective perceptions.

Authors' contribution

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Supervision: Malik Ayyad, Omar Ayaad.

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Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

The study adhered to ethical guidelines outlined in the Declaration of Helsinki, including measures to protect participants' privacy and secure data storage. The study was approved by the Institutional Review Board (IRB) of Mutah University in Jordan. Informed consent was obtained from all participants prior to enrollment, ensuring their rights to confidentiality and voluntary participation. This methodological framework ensures the rigor and reliability of the study's findings while maintaining the highest ethical standards.

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