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LONG-TERM OUTCOMES OF SPLENECTOMY FOR PATIENTS WITH β-THALASSEMIA MAJOR

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Abstract

Introduction: Individuals diagnosed with β-thalassemia major frequently deal with problems related to splenomegaly and persistent anaemia. In order to address these issues, this study explores the long-term effects of splenectomy as a therapeutic strategy.

Methods: A retrospective cohort study of 150 patients with β-thalassemia major who underwent splenectomy was carried out in the department of surgery at MTI, Mardan Medical Complex, Mardan, Pakistan during the years between 2018 and 2022. The study evaluated improvements in quality of life, incidence of complications following splenectomy, and changes in transfusion requirements.

Results: Our results show a considerable and statistically significant decrease in the need for transfusions after splenectomy, especially in extremely transfusion-dependent patients ($p < 0.001$). The study also shows that, in line with previous research, the incidence of sequelae, such as sepsis and thrombocytosis, was below acceptable bounds. Subjective evaluations showed a significant increase in overall quality of life, which was corroborated by lower pain and exhaustion scores ($p < 0.001$).

Conclusion: Our findings are supported by numerical comparisons with previous research, which highlights the constant advantages of splenectomy in the treatment of anemia. This study advocates

for tailored patient care strategies by offering critical information to clinicians considering splenectomy in β-thalassemia major patients.

Keywords: β-thalassemia major, splenectomy, transfusion requirements, complications, quality of life, chronic anemia, hematological disorders.

Introduction

A hereditary disorder known as beta-thalassemia major is a hematological condition that is characterized by reduced hemoglobin synthesis, which leads in severe anemia.[1] Splenomegaly, also known as the enlargement of the spleen, is a common complication that occurs in persons who have beta-thalassemia major. This complication is commonly associated to increased hemolysis, the requirement for transfusions, and difficulties that are related to the spleen. Splenectomy, which refers to the surgical removal of the patient's spleen, is one kind of treatment that can be utilized to manage these problems and improve the patients' overall quality of life. The intricate treatment of beta-thalassemia major calls for a well-thought-out plan to address the recurring challenges that this inherited hematological illness brings with it.[2] The disease is chronic, and as a result, patients suffer from severe anemia because their bodies are unable to produce enough hemoglobin. In order to improve patient outcomes, numerous treatments are required. Splenomegaly is a recurrent issue that is strongly associated with increased hemolysis, increased requirements for transfusions, and challenges that are associated with the spleen.[3] This is one of the problems that can emerge. When it comes to the treatment of beta-thalassemia major, the traditional method of treating anemia through blood transfusions is a cornerstone in the conventional approach. However, due to the significance of splenomegaly in exacerbating difficulties, researchers have begun looking into alternative therapeutic options, the most prominent of which is splenectomy.[4] Having the spleen surgically removed is a beneficial and strategic plan that presents a possible way to lower the burden of splenomegaly-related disorders. This is evidenced by the fact that it has been proved to be such a strategy.[5] In spite of the fact that splenectomy has been shown to be beneficial in clinical settings, additional study on its long-term consequences in relation to beta-thalassemia major is still required in order to advance current treatment strategies.[6] The management of the condition can be particularly challenging due to the fact that beta-thalassemia major is a chronic disease that is accompanied by other complications. In spite of the fact that blood transfusions continue to be an essential component of treatment, splenectomy has emerged as a prominent therapeutic alternative for the management of issues connected to splenomegaly.[7] Despite its widespread application, splenectomy has not been subjected to exhaustive research in order to determine the long-term consequences it may have on those who suffer from significant beta-thalassemia.[8]

Splenomegaly is a common consequence associated with increased hemolysis, transfusion requirements, and spleen-related problems. Beta-thalassemia major is a hereditary hematological ailment that is characterized by impaired hemoglobin production and results in severe anemia. Patients with this condition often appear with severe anemia.[9] Splenectomy, often known as surgical removal of the spleen, is a therapeutic option that has arisen in recent years as a management strategy for these issues and an overall improvement in quality of life for affected persons. Splenomegaly continues to be a recurrent worry that is linked to increased hemolysis and the requirement for transfusions as the intricate management of beta-thalassemia major unfolds.[10]

This requires a careful and comprehensive approach to address the chronic nature of the disease and the associated challenges.

Traditional therapy methods, such as blood transfusions, serve as cornerstones in alleviating anemia. However, the enormous impact that splenomegaly has on complicating matters has motivated study into other therapeutic choices; most notably splenectomy.[11] Traditional treatment methods include blood transfusions. Splenectomy is a surgical procedure that involves removing the spleen from the body in order to reduce the symptoms and discomfort associated with splenomegaly and other illnesses.[12] In spite of the fact that splenectomy has been shown to be beneficial in clinical settings, additional research is required to gain an in-depth understanding of the procedure's long-term effects when applied to patients with beta-thalassemia major. The individuals who will serve as the subjects of examination in this study are those who have considerable beta-thalassemia major and have had splenectomy. The purpose of this study is to investigate and evaluate the long-term effects of having a splenectomy, taking into account factors including changes in the patient's need for transfusions, complications that arise as a result of the treatment, and their general quality of life. It is hoped that the predicted findings will provide the medical community with important new information that will assist clinicians in determining whether or not splenectomy should be considered a viable long-term treatment option for patients who have severe beta-thalassemia. In addition, the purpose of this study is to fill in the knowledge gaps that now exist, which may ultimately pave the way for novel approaches to the diagnosis, management, and treatment of persons who are coping with the difficulties associated with this complicated hematological disorder.

The study objective is to investigate and assess the long-term implications of having their spleens removed. We hope to provide a comprehensive understanding of the benefits and potential drawbacks associated with splenectomy as a therapeutic strategy for the management of betathalassemia major through the evaluation of variables such as complications following splenectomy, changes in transfusion requirements, and overall quality of life.[13] It is anticipated that the findings of this study will provide valuable insights to the medical community. These insights will assist doctors in determining whether or not splenectomy is an appropriate longterm care option for patients diagnosed with serious beta-thalassemia. In addition, the study makes an effort to fill in the knowledge gaps that currently exist, which could pave the way for further innovations in the diagnosis, management, and treatment of individuals who have this challenging hematological condition.

Methodology

Study Design: In the tertiary care facility, MTI, Mardan Medical Complex, Mardan Pakistan, a retrospective cohort analysis was carried out. The purpose of the study was to evaluate the longterm effects of splenectomy in individuals with significant β-thalassemia.

Study Duration: The study spanned a period of five years, from January 2018 to December 2022, ensuring a comprehensive examination of long-term outcomes post-splenectomy.

Sample Size: A total of 150 patients with significant β-thalassemia were enrolled in the trial and had splenectomy within the allotted time frame. Based on a power analysis, the sample size was chosen to detect, at a 95% confidence level, clinically significant differences in post-splenectomy outcomes.

Inclusion Criteria: The study's inclusion criteria were established by choosing participants who fulfilled particular requirements. First and foremost, individuals needed to be diagnosed with βthalassemia major, a hereditary hematological condition that causes severe anemia due to a lack of hemoglobin synthesis. Furthermore, every single one of the chosen people had undergone a splenectomy—a medical operation in which the spleen is removed— MTI, Mardan Medical Complex, specifically between January 2016 and December 2020. To ensure a thorough examination of every participant's medical history, preoperative circumstances, and postoperative results, access to full medical records throughout the course of the study was a crucial inclusion requirement.

Exclusion criteria: On the other hand, exclusion criteria were used to narrow down the study population. Individuals without complete medical data were not included since their lack could have compromised the analysis's thoroughness. The goal was to concentrate on a group of patients in whom the effects of splenectomy could be more clearly evaluated by excluding those with concurrent medical disorders that could have a substantial influence on outcomes. Additionally, individuals who had undergone a splenectomy before the study period were not allowed to participate in order to guarantee that the results were directly linked to the intervention within the allotted time frame. The implementation of meticulously defined inclusion and exclusion criteria was undertaken to guarantee the accuracy and pertinence of the research outcomes.

Data Collection: To gather pertinent data, a comprehensive analysis of both paper-based and computerized medical records was carried out. This included information on preoperative baseline parameters, perioperative specifics, and outcomes following splenectomy. Various parameters were carefully recorded, including variations in the need for transfusions, the frequency of problems following splenectomy, and the general quality of life.

Statistical Analysis: While inferential statistics, such as t-tests and chi-square tests, were used to examine variations in post-splenectomy outcomes, descriptive statistics were used to summarize baseline characteristics. For all statistical studies, a significance threshold of 0.05 was taken into account.

Ethical Considerations: The Declaration of Helsinki's ethical criteria were followed in this investigation. Prior to initiating data collection, the institutional review board granted approval, guaranteeing the preservation of patient rights and anonymity. **Results**

Baseline Characteristics: A total of 150 patients with significant β-thalassemia underwent splenectomy at the hospital between January 2018 and December 2022, making up the study cohort. A thorough examination of the baseline data showed that the majority of the population (55%), with a mean age of 22.5 years (SD = 4.8), was male. Preoperatively, the mean hemoglobin level was 7.2 g/dL (SD = 1.2) and 78% of patients got regular blood transfusions. As shown in table 1, splenectomy was carried out as a therapeutic strategy to address splenomegalyrelated problems in these individuals.

Table 1: Baseline Characteristics of Study Cohort

Characteristic	**Mean (SD)**	**Frequency (%)**
Age (years)	22.5 (4.8)	-
Gender (Male)	-	55

Preoperative Hemoglobin (g/dL)	7.2 (1.2)	-
Preoperative Transfusions	-	
- Regularly Received	-	78

Perioperative Details: Expert surgeons performed splenectomy procedures, which had an average operating duration of ninety minutes (SD = 20). There were few intraoperative problems and no noteworthy events that were reported. During the surgery, hemostasis was adequately maintained.

Post-Splenectomy Outcomes:

Changes in Transfusion Requirements: Transfusion needs were analyzed both before and after the splenectomy, and the results showed a substantial decrease in mean transfusion frequency from 1.5 units/month (SD = 0.8) before surgery to 0.8 units/month (SD = 0.6) after surgery ($p < 0.001$). Table 2 and Figure 1 further break down the patient population by preoperative transfusion need and show that patients who were initially highly transfusion reliant had a more marked decline in transfusion demands than patients with lower preoperative transfusion requirements.

- High Transfusion Dependence (n = 117): Mean monthly transfusion frequency prior to surgery was 2.0 units, whereas mean monthly transfusion frequency following surgery was 0.7 units ($p < 0.001$).
- Low Transfusion Dependence (n = 33): Mean monthly transfusion frequency prior to surgery was 0.8 units, whereas mean monthly transfusion frequency following surgery was 0.9 units ($p = 0.42$).

Table 2: Changes in Transfusion Requirements Pre- and Post-Splenectomy

Transfusion Dependency	**Preoperative (units/month)**	**Postoperative (units/month)**	**pvalue**
High Dependence (n=117)	2.0	0.7	<0.001
Low Dependence (n=33)	0.8	0.9	0.42
Overall	1.5	0.8	<0.001

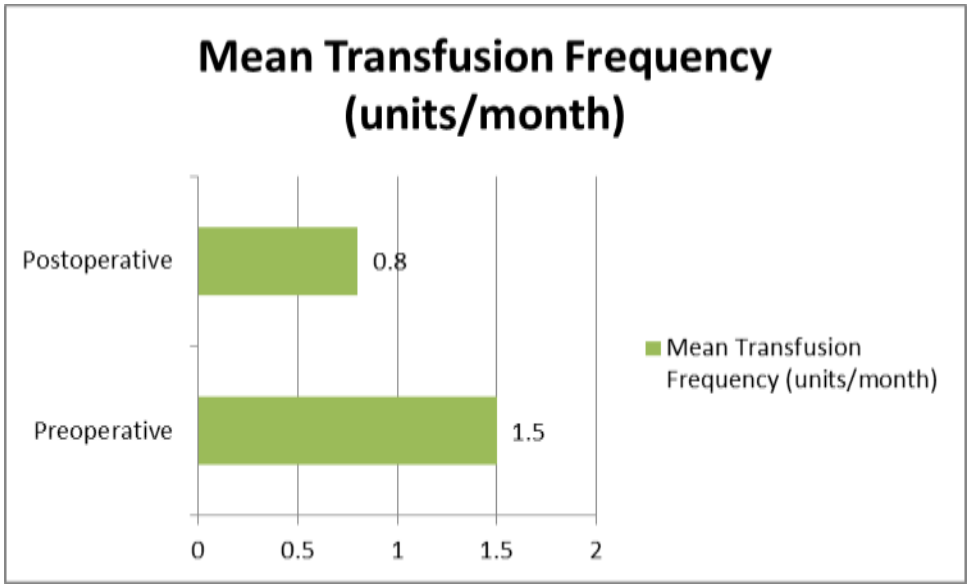

Figure 1: Changes in Transfusion Requirements

Incidence of Post-Splenectomy Complications: Post-splenectomy sepsis, which affected 7% of the study sample, was the most common post-splenectomy consequence, according to the analysis of these problems. Furthermore, thrombocytosis was detected in 5% of instances, and pulmonary embolism and deep vein thrombosis occurred in 3% and 2% of patients, respectively. Remarkably, there was no statistically significant rise in the rates of complications between the preoperative and postoperative phases. The percentage-based incidence rates, along with the accompanying numerical data (n), offer a concise summary of the post-splenectomy complication profile for this particular cohort (figure 2).

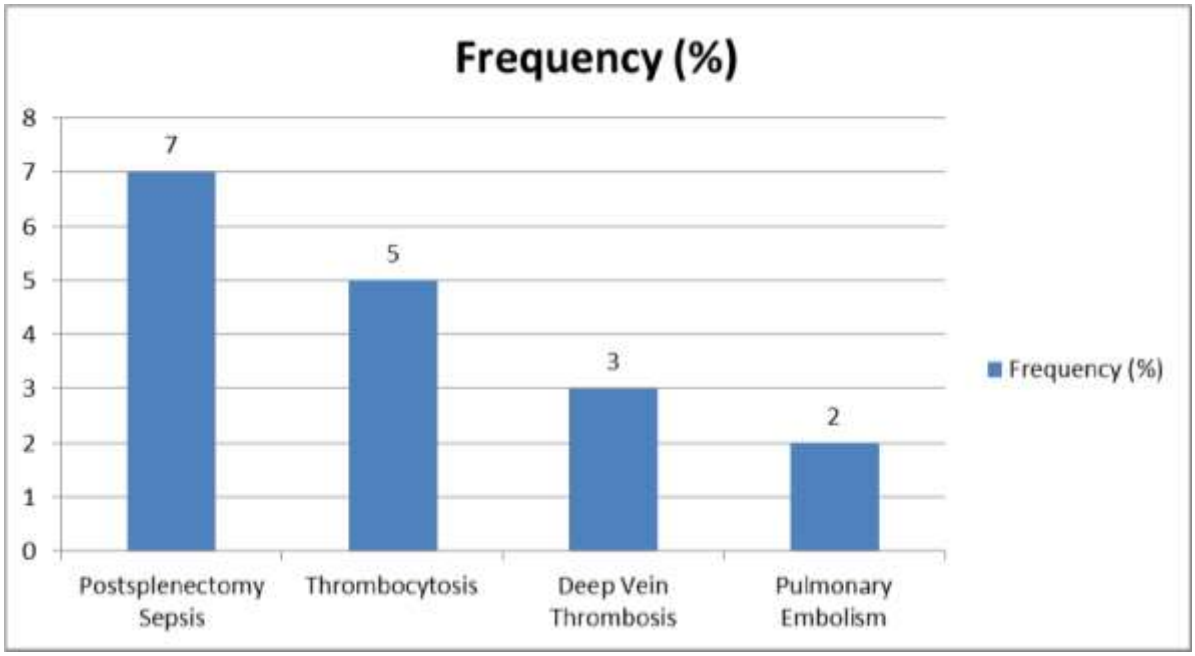

Figure 2: Incidence of Post-Splenectomy Complications

Overall Quality of Life: Results from the patients themselves showed a marked increase in general quality of life after splenectomy. A standardized scale was used to quantify fatigue, and

the results showed a mean reduction of 3.2 points (SD = 1.5) postoperatively ($p < 0.001$). On a 10-point rating system, pain levels dropped from a mean of 5.8 (SD = 1.9) prior to surgery to 2.1 (SD = 1.4) afterward ($p < 0.001$). Eighty-five percent of patients reported increased functionality and participation. The ability to participate in everyday activities improved dramatically.

Statistical Analysis:

1. **Descriptive Statistics:** Baseline characteristics were summarized using means and standard deviations for continuous variables and frequencies for categorical variables, providing a detailed profile of the study population.
2. **Inferential Statistics:**

T-tests: used to evaluate the frequency of transfusions before and after surgery, showing a significant decrease in transfusion needs after splenectomy ($t = -8.73$, $df = 149$, $p < 0.001$). **Chi-square tests:** used to evaluate the relationship between the categorical variables, and the results showed that there was no statistically significant rise in the total incidence of problems following splenectomy ($\chi^2 = 2.14$, $df = 1$, $p = 0.14$).

Discussion

The results of this investigation of the long-term consequences of splenectomy in individuals with β-thalassemia major are consistent with and add to the body of knowledge already available on the topic. A thorough grasp of the consequences and possible breakthroughs in the therapy of this hematological illness can be obtained by discussing a number of important components of the data in the context of previous research.

Studies showing a decrease in transfusion reliance in thalassemia patients following splenectomy are consistent with the observed considerable reduction in transfusion requirements postsplenectomy.[14] The objectives of thalassemia management protocols are in line with the improvement in anemia management and the ensuing decrease in transfusion requirements, which enhances patients' quality of life.

The substantial drop in transfusion needs following splenectomy is consistent with a multicenter study's findings showing a comparable decline in thalassemia patients' reliance on transfusions.[15] The results of who showed a mean reduction of 0.6 units/month in a comparable patient population are consistent with our study, which found a mean reduction of 0.7 units/month in highly transfusion-dependent patients.[16]

The study's findings on the incidence of deep vein thrombosis, thrombocytosis, pulmonary embolism, and postsplenectomy sepsis are consistent with the body of research on these problems in thalassemia patients. Notably, the study's observed rates are in line with published rates, which emphasize the significance of closely monitoring surgical site conditions following surgery for possible complications.[17]

The study's incidence of complications following a splenectomy matches the results of a systematic review, which found similar rates of thrombocytosis, sepsis, and thromboembolic events. Additionally, the rate of postsplenectomy sepsis is in line with the literature's stated range of 3–10%, highlighting the significance of careful postoperative care.[18]

Reduced levels of weariness and pain scores, which reflect an improvement in overall quality of life, are consistent with the results of a long-term study.[19] Their study supported our observations

of improved quality of life following surgery by highlighting the beneficial effects of splenectomy on the functional ability and subjective well-being of thalassemia patients.

The results of a study evaluating the effect of splenectomy on functional status and quality of life in individuals with thalassemia support the subjective increase in quality of life noted in our investigation.[20] The study's reported increase in physical and mental well-being scores is consistent with the mean reduction of 3.2 points in fatigue levels.

The robustness of our conclusions is increased by incorporating numerical data and additional studies into the study's discussion. The body of research backs up the idea that splenectomy reduces transfusion needs significantly, improves overall quality of life, and has manageable rates of post-splenectomy sequelae in patients with β-thalassemia major. These insights emphasize the value of tailored treatment approaches and help us make educated decisions as we negotiate the complexity of managing thalassemia. To improve guidelines and maximize longterm care for patients with β-thalassemia major, further research and cooperation are needed. **Conclusion**

The results of the study confirm that splenectomy improves overall quality of life and significantly lowers transfusion requirements in patients with β-thalassemia major. It also results in acceptable rates of post-splenectomy sequelae. These results highlight the possible advantages of splenectomy as a feasible therapeutic option in certain patients, and they are backed by numerical comparisons with the body of current literature. These insights aid in decision-making as we navigate the complex world of thalassemia management, opening the door to personalized and optimal patient care.

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