Splenectomy perspective for non-malignant hematological disorders: A cross-sectional study in the Eastern Province of KSA

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Abstract

Objectives: Splenectomy is considered a therapeutic modality for several hematological diseases, although complications are possible. This study assessed the effects of splenectomy on various hematological disorders and the roles of prophylactic measures on postoperative outcomes.

Methods: This was a cross-sectional study performed in KSA on adult patients with underlying non-malignant hematological disorders who had undergone splenectomy.

Results: This study examined 179 patients with various hematological disorders, 38 (21.1%) of whom had undergone a splenectomy. Of those 38 patients, more than two-thirds (73.7%) had an open splenectomy. The average hospital stay was 2–7 days, and no significant difference was observed between the open and laparoscopic approaches. Approximately 95% of the patients showed overall improvements in their condition after splenectomy. However, 26.3% of patients reported a

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recurrence or need for further treatment 1 year or more after splenectomy. Approximately 16% of patients had an increased incidence of postoperative infectious complications, particularly patients with sickle cell disease and beta thalassemia. More than half the patients who developed complications had not received vaccination preoperatively, whereas 44.4% of vaccinated patients experienced complications (p = 0.04).

**Conclusion:** Splenectomy is considered a universal line of treatment for most non-malignant hematological diseases. Although splenectomy is an effective treatment, the reasons why patients with the same disease can have different responses remains unclear. Infection is a common postoperative complication, and vaccinations are underused. This study emphasizes the roles of patient education, scheduled vaccinations and proper selection of patients in the use of splenectomy for the treatment of non-malignant hematological diseases.

**Keywords:** Eastern Province; Hematological diseases; KSA; Outcomes; Splenectomy

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**Introduction**

The spleen, one of the largest lymphatic organs involved in the function of the hematopoietic system, is responsible for filtering the blood and controlling the quality of red blood cells. It also has a unique immunological role in the recognition of antigens to be filtered from the blood.\(^1\)

Splenectomy is a therapeutic modality used to treat several non-malignant hematological diseases under certain circumstances.\(^2\) For example, in chronic immune thrombocytopenic purpura (ITP), splenectomy is indicated clinically for refractory ITP resistant to the first line treatment of corticosteroids; this treatment supports long term remission, by decreasing the destruction of platelets in the spleen.\(^2\) For sickle cell disease (SCD), splenic dysfunction occurs because of congestion of red blood cells in the red pulp, thereby increasing the risk of infection by encapsulated bacteria, acute splenic sequestration, splenomegaly and hypersplenism necessitating spleen removal.\(^1\) Furthermore, warm autoimmune hemolytic anemia is a type of AHA for which splenectomy may be indicated.\(^4\) Other diseases in which splenectomy is a therapeutic modality include hereditary spherocytosis and thalassemias.\(^5\)

Splenectomy can be performed through different modalities, including open abdominal or minimally invasive laparoscopy, the latter of which is the gold standard modality in some circumstances.\(^4\)\(^,\)\(^5\)

However, several complications can develop post-splenectomy, including increased vascular complications, particularly venous thromboembolisms, which frequently occur after splenectomy in patients with thalassemia intermedia.\(^6\) Moreover, complications such as infections are seen more often in patients who have undergone splenectomy, with an estimated incidence of 0.23–0.42% per year and a lifetime risk of 5%, than in the general population. Among all hematological diseases, sickle cell anemia and beta thalassemia major are associated with the highest risk of infection. However, with optimal pre-splenectomy prophylactic strategies, life-threatening infectious episodes can be markedly decreased.\(^7\)

This study assessed the effectiveness of prophylactic measures in patients with non-malignant hematological disorders who had undergone splenectomy, as well as the effects of these measures on complications among the Eastern Province population in KSA. This study also sought to determine the effects of splenectomy on the clinical courses of these disorders.

**Materials and Methods**

**Study design and setting**

This cross-sectional (descriptive) study involved male and female patients with certain non-malignant hematological diseases who had undergone splenectomy in Eastern Province, KSA. The participants were Saudi patients over the age of 16 years who had one of the following non-malignant hematological diseases: SCD, alpha thalassemia, beta thalassemia, ITP or autoimmune hemolytic anemia. Participants who had undergone splenectomy because of non-hematological disorders, malignant hematological disorders or trauma were excluded. Patients were grouped according to their diagnoses and then divided into splenectomized and non-splenectomized groups. The data collection sheet was formulated according to several sources from the literature.\(^8\)\(^–\)\(^11\) Descriptive statistics include the number, percentage, mean and standard deviation as appropriate. For comparisons, chi-square test or Fisher’s exact test were applied. Data analyses were performed in SPSS version 21, Armonk, New York, IBM Corporation.

**Results**

This study examined 179 patients with various hematological disorders who were treated at hematology units in public hospitals and medical centers in the Eastern Province of KSA. As shown in Table 1, the most common age group was 18–29 years (31.3%). More than half the patients were women (51.4%), and 58.1% lived in Al Ahsa. More than half (53.6%) of the patients had a high school education level or below. Furthermore, approximately half the participants had a normal BMI (47.4%), whereas the others were either overweight (29.3%) or obese (13.8%). In 36.8% of the patients, a diagnosis of hematological disease had been made before the age of 18 years. Most patients had SCD (75.4%) and had been diagnosed before the age of 18 years (82.1%). Socio-demographic variables, such as age group, sex, area of residence, educational level, marital status, BMI, associated blood diseases and age at diagnosis, did not significantly influence the splenectomy procedure (all P-values > 0.05).
Characteristics of 38 patients (21.1%) who underwent splenectomy are described in Table 2.

The most common reason for not undergoing splenectomy was that the procedure had not been discussed by the treating physicians, which was followed by a fear of postoperative complications and the patients' believing that the procedure was not needed, as shown in Figure 1.

An open splenectomy was performed in more than two-thirds (73.7%) of patients in whom the entire spleen was removed. Moreover, splenectomy was performed electively in 73.7% of patients, and 63.2% of patients remained in the hospital for 2–7 days after the procedures. No significant difference was observed between the open and laparoscopic approaches, as shown in Table 3.

Furthermore, 81.6% of patients who underwent splenectomy required preoperative blood transfusion, compared with 50% who continued to have transfusions postoperatively. Additionally, 94.7% of patients showed an overall improvement in their condition after splenectomy. Eventually, 26.3% of patients relapsed after splenectomy and required further therapy. However, the duration of this interval was not significantly correlated with the underlying hematological disease (P-value >0.05), as shown in Table 4.

A total of 47.4% of patients were offered vaccines preoperatively, whereas 55.3% were offered vaccines postoperatively. Of note, more than half the patients (55.6%) who developed complications did not receive vaccination preoperatively, whereas 44.4% of patients received vaccination preoperatively (P-value 0.04), as shown in Table 5.

Additionally, 55.3% of patients were instructed to seek care at a nearby facility if they experienced fever symptoms in the postoperative period. Similarly, 81.6% of patients were offered antibiotics postoperatively, and 15.8% of patients had an increased incidence of infections, particularly pneumonia and surgical site infections. However, no significant relationship was observed between age group and the provision of antibiotics postoperatively ($\chi^2 = 4.791; p = 0.396$), as shown in Table 6.

In nine patients, complications developed after the procedure. Three patients developed surgical site infections, three developed pneumonia, and three had venous thrombosis. Approximately 88.9% of patients with complications received

### Table 1: Socio-demographic characteristics of patients according to splenectomy status.

| Study variables       | Overall N (%) (n = 179) | Splenectomy N (%) (n = 38) | No N (%) (n = 141) | $\chi^2$ | P-value* |
|-----------------------|-------------------------|-----------------------------|---------------------|---------|----------|
| Age group             |                         |                             |                     |         |          |
| <18 years             | 23 (12.8%)              | 14 (36.8%)                  | 07 (49.2%)          | 6.448   | 0.168    |
| 18–29 years           | 56 (31.3%)              | 11 (28.9%)                  | 45 (31.9%)          |         |          |
| 30–39 years           | 54 (30.2%)              | 11 (28.9%)                  | 43 (30.4%)          |         |          |
| 40–49 years           | 33 (18.4%)              | 02 (5.2%)                   | 31 (21.9%)          |         |          |
| ≥50 years             | 13 (07.3%)              | 00 (00.0%)                  | 13 (09.2%)          |         |          |
| Sex                   |                         |                             |                     |         |          |
| Male                  | 87 (46.6%)              | 21 (55.3%)                  | 66 (46.8%)          | 0.857   | 0.355    |
| Female                | 92 (51.4%)              | 17 (44.7%)                  | 75 (53.2%)          |         |          |
| Residence area        |                         |                             |                     |         |          |
| Inside Al Ahsa        | 104 (58.1%)             | 18 (47.4%)                  | 86 (61.0%)          | 2.282   | 0.131    |
| Outside Al Ahsa       | 75 (41.9%)              | 20 (52.6%)                  | 55 (39.0%)          |         |          |
| Educational level     |                         |                             |                     |         |          |
| High school or below  | 96 (53.6%)              | 18 (47.4%)                  | 78 (55.3%)          | 0.761   | 0.383    |
| Bachelor’s degree or  | 83 (46.4%)              | 20 (52.6%)                  | 63 (44.7%)          |         |          |
| above                 |                         |                             |                     |         |          |
| Marital status        |                         |                             |                     |         |          |
| Unmarried             | 72 (40.2%)              | 15 (39.5%)                  | 57 (40.4%)          | 0.011   | 0.915    |
| Married               | 107 (59.8%)             | 23 (60.5%)                  | 84 (59.6%)          |         |          |
| BMI (n = 116)         |                         |                             |                     |         |          |
| Underweight (<18.5)   | 11 (09.5%)              | 02 (05.4%)                  | 09 (11.4%)          | 4.989   | 0.173    |
| Normal (18.5–24.9)    | 55 (47.4%)              | 21 (56.8%)                  | 34 (43.0%)          |         |          |
| Overweight (25–29.9)  | 34 (29.3%)              | 07 (18.9%)                  | 27 (34.2%)          |         |          |
| Obese (≥30)           | 16 (13.8%)              | 07 (18.9%)                  | 09 (11.4%)          |         |          |
| Associated blood diseases |                       |                             |                     |         |          |
| Sickle cell anemia    | 135 (75.4%)             | 29 (76.3%)                  | 106 (75.2%)         | 5.909   | 0.315    |
| Alpha thalasemia      | 10 (05.6%)              | 02 (07.9%)                  | 07 (05.0%)          |         |          |
| Beta thalasemia       | 06 (03.4%)              | 03 (07.9%)                  | 03 (02.1%)          |         |          |
| Immune thrombocytopenic purpura | 06 (03.4%) | 01 (02.6%) | 05 (03.5%) |         |          |
| Autoimmune hemolytic anemia | 05 (02.8%) | 01 (02.6%) | 04 (02.8%) |         |          |
| Other                 | 17 (09.5%)              | 01 (02.6%)                  | 16 (11.3%)          |         |          |
| Age at diagnosis      |                         |                             |                     |         |          |
| <18 years             | 147 (82.1%)             | 34 (89.5%)                  | 113 (80.1%)         | 1.776   | 0.183    |
| ≥18 years             | 32 (17.9%)              | 04 (10.5%)                  | 28 (19.9%)          |         |          |

* P-value calculated with chi-square test.
Table 2: Characteristics of patients before and after the splenectomy procedure (n = 38).

| Variables                                      | N  | (%)  |
|------------------------------------------------|----|------|
| **Age at diagnosis**                           |    |      |
| • <18 years                                    | 14 | 36.8%|
| • 18–29 years                                  | 11 | 28.9%|
| • 30–39 years                                  | 11 | 28.9%|
| • 40–49 years                                  | 02 | 05.3%|
| **Type of splenectomy procedure**              |    |      |
| • Laparoscopic splenectomy                     | 10 | 26.3%|
| • Open splenectomy                             | 28 | 73.7%|
| **Type of procedure**                          |    |      |
| • Elective and discussed with patient          | 28 | 73.7%|
| • Emergency                                    | 10 | 26.3%|
| **Duration of postoperative hospital stay**    |    |      |
| • 2–7 days                                     | 24 | 63.2%|
| • 8 days or more                               | 14 | 36.8%|
| **Preoperative vaccination**                   |    |      |
| • Yes                                          | 18 | 47.4%|
| • No                                           | 20 | 52.6%|
| **Postoperative regular vaccination**          |    |      |
| • Yes                                          | 21 | 55.3%|
| • No                                           | 17 | 44.7%|
| **Postoperative warning to visit doctor immediately for fever** | | |
| • Yes                                          | 21 | 55.3%|
| • No                                           | 17 | 44.7%|
| **Number of preoperative blood transfusions**  |    |      |
| • Never                                        | 07 | 18.4%|
| • Once per week                                | 12 | 31.6%|
| • Once in 2 weeks                              | 01 | 02.6%|
| • Once in 3 weeks                              | 03 | 07.9%|
| • Once in 4 weeks                              | 03 | 07.9%|
| • More than once in 4 weeks                    | 04 | 10.5%|
| **Number of postoperative blood transfusions** |    |      |
| • Never                                        | 19 | 50.0%|
| • Once per week                                | 08 | 21.1%|
| • Once in 2 weeks                              | 01 | 02.6%|
| • Once in 3 weeks                              | 03 | 07.9%|
| • Once in 4 weeks                              | 03 | 07.9%|
| • More than once in 4 weeks                    | 04 | 10.5%|
| **Postoperative antibiotic administration**    |    |      |
| • Yes                                          | 31 | 81.6%|
| • No                                           | 07 | 18.4%|
| **Postoperative complications**                |    |      |
| • No                                           | 29 | 76.3%|
| • Infections (pneumonia/surgical site infections) | 06 | 15.8%|
| • Venous thrombosis                            | 03 | 07.9%|

**Figure 1**: Reasons for not undergoing splenectomy.
Table 3: Relationships between procedure type and patient characteristics pre- and postoperatively (n = 38).

| Factor                        | Type of procedure | \( \chi^2 \) | P-value* |
|-------------------------------|-------------------|--------------|----------|
|                               | Laparoscopy (n = 10) | Laparotomy (n = 28) |          |
| Associated blood diseases     |                   |              |          |
| Sickle cell anemia            | 09 (90.0%)        | 20 (71.4%)   | 2.552    | 0.918    |
| Alpha thalasemia              | 0                 | 03 (10.7%)   |          |          |
| Beta thalasemia               | 01 (10.0%)        | 03 (10.7%)   |          |          |
| Immune thrombocytopenic purpura| 0                | 01 (03.6%)   |          |          |
| Autoimmune hemolytic anemia   | 0                 | 01 (03.6%)   |          |          |
| Complications                 |                   |              |          |
| Yes                           | 04 (40.0%)        | 05 (17.9%)   | 1.999    | 0.205    |
| No                            | 06 (60.0%)        | 23 (82.1%)   |          |          |
| Preoperative blood transfusion|                   |              |          |
| Yes                           | 08 (80.0%)        | 23 (82.1%)   | 0.023    | 1.000    |
| No                            | 02 (20.0%)        | 05 (17.9%)   |          |          |
| Postoperative blood transfusion|                 |              |          |
| Yes                           | 07 (70.0%)        | 12 (42.9%)   | 2.171    | 0.269    |
| No                            | 03 (30.0%)        | 16 (57.1%)   |          |          |
| Postoperative antibiotics     |                   |              |          |
| Yes                           | 09 (90.0%)        | 22 (78.6%)   | 0.640    | 0.650    |
| No/do not know                | 01 (10.0%)        | 06 (21.4%)   |          |          |
| Postoperative improvement of condition|        |              |          |
| Yes                           | 10 (100%)         | 26 (92.9%)   | 0.754    | 1.000    |
| No                            | 0                 | 02 (07.1%)   |          |          |
| Length of hospital stay       |                   |              |          |
| 2–7 days                      | 06 (60.0%)        | 18 (64.3%)   | 0.058    | 1.000    |
| 8 days or more                | 04 (40.0%)        | 10 (35.7%)   |          |          |

* P-value calculated with Fisher’s exact test.

Table 4: Patterns of improvement in patients with blood disorders after surgery (n = 38).

| Factor                        | Improvement | \( \chi^2 \) | P-value* |
|-------------------------------|-------------|--------------|----------|
|                               | Yes (n = 36) | No (n = 2)  |          |
| Associated blood diseases     |             |              |          |
| Sickle cell anemia            | 27 (75.0%)  | 02 (100%)    | 0.655    | 1.000    |
| Alpha thalasemia              | 03 (08.3%)  | 0            |          |          |
| Beta thalasemia               | 04 (11.1%)  | 0            |          |          |
| Immune thrombocytopenic purpura| 01 (02.8%)  | 0            |          |          |
| Autoimmune hemolytic anemia   | 01 (02.8%)  | 0            |          |          |
| Interval between splenectomy and recurrence| |              |          |
| <1 month                      | 01 (02.8%)  | 0            | 19.950    | 0.078    |
| 1–3 months                    | 03 (08.3%)  | 0            |          |          |
| 4–6 months                    | 02 (05.6%)  | 0            |          |          |
| 7–12 months                   | 07 (19.4%)  | 0            |          |          |
| >12 months                    | 09 (25.0%)  | 01 (50.0%)   |          |          |
| Other                         | 0           | 01 (50.0%)   |          |          |
| No symptoms                   | 14 (38.9%)  | 0            |          |          |

* P-value calculated with Fisher’s exact test.
blood transfusions preoperatively, whereas 11.1% did not. Moreover, no significant relationships in terms of the pre- and postoperative blood transfusions were observed among the studied hematological diseases. Furthermore, 77.8% of complications were found in patients with SCD, and the remainder were found in patients with beta thalassemia.

Discussion

Splenectomy can be the modality of choice for the treatment of different hematological diseases.\(^8,9\) In our study, splenectomy was performed in 21.2% of patients with underlying hematological disease. Patients with SCD, followed by patients with beta thalassemia, constituted a large proportion of those who underwent splenectomy. These findings are concordant with those from a previous study in Oman indicating that patients with SCD and beta thalassemia are more likely to have splenectomy than other hematological disorders.\(^10\) This finding may be explained by the relatively high prevalence of SCD in the Mediterranean Basin the Middle East.\(^1,12\) Moreover, we found that most patients with SCD underwent splenectomy at less than 18 years of age or between 30 and 39 years of age, unlike those with beta and alpha thalassemia, who underwent the procedure before the age of 30. These findings might be explained by a relatively high risk of splenic sequestration crisis in younger patients with SCD before splenectomy.

Susceptibility to infection post-splenectomy is relatively high, as clearly demonstrated in a prospective cohort study in Los Angeles and another study conducted in Olmsted County. Both studies have found that splenectomy can have infection complications in 50% and 40% of patients.\(^13,14\) However, despite the increased risk of infection post-splenectomy,\(^13\) only half the patients who underwent splenectomy were instructed to visit a health care facility if they experienced fever symptoms in the postoperative period. Nevertheless, we observed that only 15.8% of participants developed post-splenectomy infection—a percentage significantly lower than that previously reported.\(^13,14\)

The British Committee for Standards in Hematology has set guidelines for preventing infections in patients post-splenectomy, on the basis of three components:

| Table 5: Relationships among postoperative complications and pre- or postoperative blood transfusion, vaccination and associated hematological diseases in patients (n = 38). |
|---|---|---|---|
| Factor | Complications | | |
| | Yes | No | \(\chi^2\) | P-value* |
| | (n = 9) | (n = 29) |
| Associated blood diseases | | | |
| · Sickle cell anemia | 07 (77.8%) | 22 (75.9%) | 4.932 | 0.694 |
| · Alpha thalassemia | 0 | 03 (10.3%) | | |
| · Beta thalassemia | 02 (22.2%) | 02 (06.8%) | | |
| · Immune thromboocytopenic purpura | 0 | 01 (03.4%) | | |
| · Autoimmune hemolytic anemia | 0 | 01 (03.4%) | | |
| Preoperative blood transfusion | | | |
| · Yes | 08 (88.9%) | 23 (79.3%) | 0.419 | 1.000 |
| · No | 01 (11.1%) | 06 (20.7%) | | |
| Postoperative blood transfusion | | | |
| · Yes | 06 (66.7%) | 13 (44.8%) | 1.310 | 0.447 |
| · No | 03 (33.3%) | 16 (55.2%) | | |
| Preoperative vaccination | | | |
| · Yes | 04 (44.4%) | 14 (48.3%) | 0.040 | 1.000 |
| · No | 05 (55.6%) | 15 (51.7%) | | |
| Postoperative vaccination | | | |
| · Yes | 04 (44.4%) | 17 (58.6%) | 0.558 | 0.703 |
| · No | 05 (55.6%) | 12 (41.4%) | | |

* P-value calculated with Fisher’s exact test.

| Table 6: Pattern of antibiotics provided by age group undergoing splenectomy (n = 38). |
|---|---|---|---|
| Age group | Antibiotics | \(\chi^2\) | P-value* |
| | Yes | No | |
| | (n = 31) | (n = 7) | |
| <18 years | 13 (41.9%) | 01 (14.2%) | 4.791 | 0.396 |
| 18–29 years | 06 (19.3%) | 05 (71.4%) | | |
| 30–39 years | 10 (32.2%) | 01 (14.2%) | | |
| 40–49 years | 02 (6.4%) | 0 | | |

* P-value calculated with Fisher’s exact test.
vaccination, prophylaxis with antibiotics and patient education. These components have an essential role, particularly within the first 3 years after the operation, because of infection susceptibility. The findings from our study support this association: patients with underlying SCD who underwent splenectomy and patients who were not offered vaccination, particularly preoperatively, were more likely to have infection complications. Antibiotics have been recommended to be prescribed post-splenectomy for children under the age of 5 years. However, we observed that prescribing antibiotics to patients up to the age of 40 remains a common practice among physicians.

The postoperative hospital stay after a splenectomy procedure can vary, with an average length between 3 and 9 days. However, a study has reported that laparoscopic splenectomy for benign hematological disorders is significantly associated with prolonged postoperative hospital stays and greater blood loss. In our study, most patients had a hospital stay period between 2 and 7 days. This time period is similar to that in the general population and less than that previously reported in patients with hematological diseases who underwent splenectomy.

Previous studies suggest better outcomes and improvements after the procedure for several hematological diseases, although no studies have addressed the duration of improvement before the need for another line of treatment. We defined improvement as a decrease in blood component requirements, the frequency of hospitalization and the need for additional lines of treatment. We found that splenectomy resulted in 30% less blood component transfusion than that before splenectomy, and this finding was observed in patients with SCD, as previously reported. However, blood transfusion requirements in patients with beta thalassemia did not differ pre- and postoperatively, in contrast to findings in previous studies. Furthermore, preoperative selective blood transfusions in patients with SCD can help minimize postoperative complications. Additionally, most patients showed an overall improvement in their condition after the procedure. Approximately one-third of patients had an average period of 1 year without a need for an additional line of treatment. However, no significant difference was observed in terms of improvement across diseases. The splenectomy procedure remains often performed in patients with SCD and beta thalassemia. Vaccines are mandatory and aid in preventing overwhelming post-splenectomy infections, although vaccination in this study did not alter the infection frequency.

This study addresses several essential points indicating the role of splenectomy in treating various hematological diseases and its influence on the clinical course. Furthermore, our findings emphasize that specific measures might minimize perioperative complications.

Limitations

Several limitations might have influenced the results of this study. First, the sample size is not sufficient to represent the effects of splenectomy on various hematological diseases. Moreover, a comparison to the population that did not undergo splenectomy is highly warranted.

Conclusion

Although many treatment paradigms for non-malignant hematological diseases have emerged, splenectomy is considered an important line of treatment for most of these diseases. However, the variable nature of the diseases and immunological weakness have led to controversy regarding whether splenectomy is a suitable treatment option.

Additionally, although splenectomy is an effective treatment for certain non-malignant hematological diseases, why one group of patients in the same disease population may benefit while others do not remains unclear. Nonetheless, preoperative vaccination and elective surgery clearly result in better outcomes. Therefore, a combination of elective splenectomy, scheduled vaccinations and proper selection of patients who would benefit from splenectomy would result in optimal outcomes.

Recommendations

Because spleen removal can result in several complications in patients with non-hematological diseases, we recommend pre- and postoperative education of patients by treating physicians to avoid these unwanted and preventable complications. Furthermore, regular vaccines should be administered to patients pre- and postoperatively. In addition, further studies should be performed in a broader cohort of patients to obtain more reliable and valid results.

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Conflict of interest

The authors have no conflict of interest to declare.

Ethical approval

Ethical approval for the study was obtained from the Institutional Review Board and the Research Ethics Committee of King Faisal University in Al Hasa, KSA. Research Number: 04/01/2019, date: 27/10/2019. For this type of study, written informed consent was required to be obtained from participants before they completed questionnaires.

Authors contributions

MS: conceptualization; supervision; data curation; writing original draft; writing review and editing. FJ: data curation; writing original draft; investigation; methods. SE: data curation; writing original draft; investigation; methods. SI: formal analysis; methods; software. AE: conceptualization; supervision; writing original draft; writing review and editing. All authors have critically reviewed and approved.
the final draft and are responsible for the content and similarity index of the manuscript.

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References

1. Bonnet S, Guedon A, Ribei AL, Suarez F, Tamburini J, Gaujoux S. Indications and outcome of splenectomy in hematologic disease. J Visc Surg 2017 Dec 1; 154(6): 421–429.
2. Onisii M, Vladareanu AM, Sinu A, Giaman M, Bumbea H. Idiopathic thrombocytopenic purpura (ITP) - new era for an old disease. Rom J Intern Med 2019 Dec 1; 57(4): 273–283. https://doi.org/10.2478/rjim-2019-0014. PMID: 31197777.
3. El Hoss S, Brousse V. Considering the spleen in sickle cell disease. Expert Rev Hematol 2019 Jul; 12(7): 563–573. https://doi.org/10.1080/17474086.2019.1627192. Epub 2019 Jun 14. PMID: 31195851.
4. Machado NO, Grant CS, Alkindi S, Daar S, Al-Kindy N, Al Lamki Z, et al. Splenectomy for haematological disorders: a single center study in 150 patients from Oman. Int J Surg 2009 Jan 1; 7(5): 476–481.
5. Habermalz B, Sauerland S, Decker G, Delaitre B, Gigot JF, Leandros E, et al. Laparoscopic splenectomy: the clinical practice guidelines of the European Association for Endoscopic Surgery (EAES). Surg Endosc 2008; 22(4): 821–848.
6. Costi R, Ruiz CC, Romboli A, Wind P, Violi V, Le Bian AZ. Partial splenectomy; who, when and how. A systematic review of the 2130 published cases. J Pediatr Surg 2019 Aug 1; 54(8): 1527–1538.
7. Piel FB, Steinberg MH, Rees DC. Sickle cell disease. N Engl J Med 2017 Apr 20; 376(16): 1561–1573.
8. Kristinson SY, Gridley G, Hoover RN, Check D, Landgren O. Long-term risks after splenectomy among 8,149 cancer-free American veterans: a cohort study with up to 27 years follow-up. Haematologica 2014 Feb 1; 99(2): 392–398.
9. Gokarn N, Manwani D, Friedmann P, Borenstein SH, Jan D, Renaud E. Outcomes after early splenectomy for hematological disorders. J Laparosc Endosc Adv Surg Tech 2014 Dec 1; 24(12): 897–900.
10. Ghaemiet al. Alnoaizil MM, Al-Blewii S, Zaki S, El-weiwi A, Ahmad N. Splenectomy in patients with sickle cell disease in Tabuk. Open Access Maced J Med Sci 2016 Mar 15; 4(1): 107.
11. Alwabari A, Parida L, Al-Salem AH. Laparoscopic splenectomy and/or cholecystectomy for children with sickle cell disease. Pediatr Surg Int 2009 May 1; 25(5): 417–421.
12. Patel NY, Chilson AM, Mathiason MA, Kallies KJ, Botten WA. Outcomes and complications after splenectomy for hematologic disorders. Am J Surg 2012 Dec 1; 204(6): 1014–1020.
13. Kealey GP, Dhungel V, Wideroff MJ, Liao J, Choi K, Skeete DA, et al. Patient education and recall regarding post-splenectomy immunizations. J Surg Res 2015 Dec 1; 199(2): 580–585.
14. White KS, Covington D, Churchill P, Maxwell JG, Norman KS, Clancy TV. Patient awareness of health precautions after splenectomy. Am J Infect Control 1991 Feb; 19(1): 36–41.
15. Davies JM, Lewis MP, Wilmeris J, Ralf I, Ladhani S, Bolton-Maggs PH. Review of guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen: prepared on behalf of the British Committee for Standards in Haematology by a working party of the Haematology Oncology task force. Br J Haematol 2011 Nov; 155(3): 308–317.
16. Friedman RL, Hiatt JR, Korman JL, Fackliss K, Cymerman J, Phillips EH. Laparoscopic or open splenectomy for hematologic disease: which approach is superior? J Am Coll Surg 1997 Jul 1; 185(1): 49–54.
17. Al-Mulhim AS. Laparoscopic splenectomy for massive splenomegaly in benign hematological diseases. Surg Endosc 2012 Nov 1; 26(11): 3186–3189.
18. Mishra B, Nayak MK, Mishra S, Das I. Splenectomy in sickle cell haemoglobinopathies. Int Surg J 2019 Mar 26; 6(4): 1371–1375.
19. Merchant RH, Shah AR, Ahmad J, Karnik A, Rai N. Post splenectomy outcome in β-thalassemia. Indian J Pediatr 2015 Dec 1; 82(12): 1097–1100.
20. Memon AS, Memon R, Muhammad AT, Ali SA, Siddiqui AJ. Splenectomy: does it help in patients with thalassemia major. J Liaquat Univ Med Health 2017 Jan 1; 16: 1–2.
21. Crary SE, Buchanan GR. Vascular complications after splenectomy for hematologic disorders. Blood 2009 Oct 1; 114(14): 2861–2868.
22. Sabbagh A, Keikhai B, Joorabian M, Behzad MM, Momeni M. Retrospective study of the incidence of portal vein thrombosis after splenectomy in hematological disorders: risk factors and clinical presentation. Blood Cell Mol Dis 2019 Feb 1; 74: 1–4.
23. Buzelé R, Barbier L, Sauvanet A, Fantin B. Medical complications following splenectomy. J Visc Surg 2016; 153(4): 277–286.
24. Barmparas G, Lamb A, Lee D, Nguyen B, Eng J, Bloom M, et al. Post-operative infection risk after splenectomy: a prospective cohort study. Int J Surg 2015; 17: 10–14.
25. Hernandez MC, Khasawneh M, Contreras-Peraza N, Lohse C, Stephens D, Kim BD, et al. Vaccination and splenectomy in Olmsted County. Surgery 2019 Oct 1; 166(4): 556–563.
26. Steele O, Duncan AL, Simms LN, Duncan SA, Byles SED. Outcomes and complications following splenectomy immunizations. J Visc Surg 2016; 153(4): 277–286.
27. Santos M. Splenectomy for non-malignant hematological disorders: A cross-sectional study in the Eastern Province of KSA. J Taibah Univ Med Sc 2022;17(5):774–781.

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