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The Effect of Preoperative Anemia on Hiatal Hernia Surgery and Postoperative Complications

Preoperatif Aneminin Hiatal Herni Cerrahisi ve Postoperatif Komplikasyonlara Etkisi

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ABSTRACT

Aim: Anemia is associated with increased mortality and morbidity in all patients undergoing surgery. This study aimed to reveal to what extent anemia caused postoperative complications before hiatal hernia surgery.

Material and Methods: One hundred and ninety-two patients operated for hiatal hernia in our clinic between 2015 and 2019 were analyzed retrospectively. Patients were compared according to demographics, preoperative laboratory values, preoperative Charlson comorbidity index score, hiatal hernia type, postoperative intensive care requirement, presence of postoperative complications, Clavien-Dindo score, blood transfusion need, and length of hospital stay.

Results: Of the patients, 109 were female and 83 were male. The mean age was 50.1±9.1 years. Fifty-four (28.2%) of the patients were in the anemic group, and 138 (71.8%) were in the non-anemic group. There was no statistically significant difference between the groups in terms of gender distribution (p=0.663). When the groups were compared in terms of age distribution, it was found that the anemic group was older than the non-anemic group and the difference was statistically significant (p<0.001). There was a significant difference between the groups in terms of the postoperative complications rate and it was more common in the anemic group (p<0.001). There was a significant difference between the groups in terms of the need for intensive care and blood transfusion in the postoperative period (p=0.020, p<0.001, respectively).

Conclusion: Preoperative anemia increases postoperative complications in hiatal hernia surgery. Therefore, the presence of anemia should be investigated before hiatal hernia surgery and patients with anemia should be followed up closely postoperatively.

Keywords: Anemia; hiatal hernia; morbidity; mortality.

ÖZ

Amaç: Anemi, cerrahi geçiren tüm hastalarda artmış mortalite ve morbidite ile ilişkilidir. Bu çalışmada, hiatal herni cerrahisi öncesi aneminin ne ölçüde postoperatif komplikasyonlara neden olduğunu ortaya koymak amaçlandı.

Gereç ve Yöntemler: Kliniğimizde, 2015 ve 2019 yılları arasında hiatal herni nedeniyle ameliyat edilmiş olan hastalar geriye dönük olarak incelendi. Hastalar demografik, preoperatif laboratuvar değerleri, preoperatif Charlson komorbidite indeksi skoru, hiatal herni tipi, postoperatif yoğun bakım gereksinimi, postoperatif komplikasyon varlığı, Clavien-Dindo skoru, kan transfüzyon ihtiyacı ve hastanede kalış süresi açısından karşılaştırıldı.

Bulgular: Hastaların 109'u kadın ve 83'ü erkek idi. Yaş ortalaması 50,1±9,1 yıl idi. Hastaların 54'ü (%28,2) anemik grupta ve 138'i (%71,8) ise anemik olmayan grupta idi. Cinsiyet dağılımı açısından gruplar arasında istatistiksel olarak anlamlı bir fark yoktu (p=0,663). Gruplar yaş dağılımı açısından karşılaştırıldığında, anemik grubun anemik olmayan gruba göre daha yaşlı olduğu ve bu farkın istatistiksel olarak da anlamlı olduğu saptandı (p<0,001). Postoperatif komplikasyon oranı açısından gruplar arasında anlamlı bir fark vardı ve anemik grupta daha sık olduğu görüldü (p<0,001). Postoperatif dönemde yoğun bakım ünitesi ve kan transfüzyonu ihtiyacı açısından da gruplar arasında anlamlı bir fark vardı (sırasıyla p=0,020, p<0,001).

Sonuç: Preoperatif anemi, hiatal herni cerrahisinde postoperatif komplikasyonları arttırır. Bu nedenle, hiatal herni ameliyatı öncesi anemi varlığı araştırılmalı ve anemisi olan hastalar postoperatif dönemde yakın takip edilmelidir.

Anahtar kelimeler: Anemi; hiatal herni; morbidite; mortalite.

INTRODUCTION

Hiatal hernia is a common pathology. In a hiatal hernia, the normal anatomy of the gastroesophageal junction and the diaphragmatic hiatus is disrupted. Hiatal hernia is a predisposing factor for gastroesophageal reflux disease (GERD). According to United States of America statistics, hiatal hernia could be seen between 10% and 80% of adults (1). It is detected with a rate of 0.8-2.9% in patients who have undergone endoscopy (2,3).

The cause of anemia in the hiatal hernia is an iron deficiency caused by Cameron's ulcer due to hernia (4,5). However, Cameron ulcer was seen in only 29-42% of anemic hiatal hernia patients. Furthermore, when patients were operated on for hiatal hernia that caused anemia, it was observed that their anemic status improved (6). It has been shown that anemia and malnutrition increase mortality and morbidity in all patients undergoing surgery (7). Another cause of morbidity is postoperative complications. These complications are seen with a rate of 3-45% after hiatal hernia surgery (8). Complications are divided into those related to the patient and those that are not. Therefore, anemia is a factor that causes complications depending on the patient's status in hiatal hernia surgery.

The aim of this study was to reveal the effect of anemia existing before hiatal hernia surgery on perioperative complications.

MATERIAL AND METHODS

Patients who were operated for hiatal hernia in the General Surgery Clinic of Okmeydanı Training and Research Hospital between January 2015 and January 2019 were retrospectively analyzed. Patients who were operated for hiatal hernia, who had no history of abdominal surgery, whose hiatal hernia type was determined by preoperative endoscopy, who had preoperative blood tests, and whose data were complete, were included in the study. Patients who had surgery with the diagnosis of recurrent hiatal hernia, who underwent additional surgery together with the hiatal operation, who had a history of abdominal surgery, and whose preoperative blood tests and endoscopy data were missing were excluded from the study. Physical examination, blood tests (complete blood count, iron, ferritin, serum iron-binding capacity), chest radiography, and upper gastrointestinal endoscopy were routinely performed on all patients before surgery.

Data Collection

Demographics, complaints at the time of admission, preoperative laboratory values, preoperative upper gastrointestinal endoscopy reports, hiatal hernia type, operation timing (emergency-elective), intraoperative or postoperative blood transfusion, perioperative mortality, and morbidity, the length of hospital stay was recorded.

Study Design and Evaluation

According to the World Health Organization, anemia is defined as serum hemoglobin levels below 12 mg/dL in female and 13 mg/dL in male (10). Hemoglobin value was determined from the complete blood count of the patients within one month before surgery. According to their serum hemoglobin level, the patients were divided into two groups: anemic and the group without anemia. In our clinic, the presence of iron deficiency anemia is investigated in patients with endoscopic pathology. Iron, ferritin, and serum iron binding capacity tests were performed in all patients preoperatively, along with routine laboratory tests. The patient's preoperative status and comorbid diseases were examined according to the Charlson comorbidity index (CCI), and each patient's CCI score was determined (10,11). Postoperative complications were graded according to their severity using the modified Clavien-Dindo (CD) scale (12). The group with and without anemia was compared according to demographics, preoperative laboratory values, preoperative CCI score, hiatal hernia type, postoperative intensive care requirement, postoperative complications, CD degree, need for blood transfusion, and length of hospital stay.

All patients were evaluated preoperatively by the Anesthesia and Reanimation Clinic. According to the hemoglobin >10 mg/dl in patients with additional disease in elective surgery, and hemoglobin >7 mg/dl in patients without the additional disease, general anesthesia was approved for use in elective surgery (13).

The local ethics committee approval was obtained from the Clinical Researches Ethics Committee of Okmeydanı Training and Research Hospital (20.02.2019, 57).

Statistical Analysis

The conformity of the variables to the normal distribution was examined using visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov and Shapiro-Wilk tests). Mean and standard deviation (SD) were used in the analysis of continuous data. Median, minimum, maximum, and interquartile range (IQR) were used in the analysis of ordinal data. Frequency (n) and percentage values (%) were used when defining categorical variables. The Fisher's exact and Fisher-Freeman-Halton tests were used to evaluate the relationship between categorical variables. The Independent samples t-test and the Mann-Whitney U test were used to compare the two independent groups. The statistical significance level of the data was taken as $p<0.05$. Statistical analyzes were performed using the MedCalc v.19.5.1 program and www.e-picos.com (New York).

RESULTS

During the study, 215 patients were operated on with the diagnosis of hiatal hernia in our clinic. One patient with the diagnosis of recurrent hiatal hernia, six patients who underwent hiatal surgery and cholecystectomy, five patients with a history of abdominal surgery, eight patients with missing preoperative blood tests, and three patients with missing preoperative endoscopy data were excluded from the study. A total of 192 patients who met the inclusion criteria were included in the study. Of the 192 patients, 109 (56.8%) were female, and 83 (43.2%) were male. The mean age of the patients was 50.1±9.1 years.

Patients with hemoglobin levels below 12 mg/dL in female and 13 mg/dL in male were considered anemic. While the hemoglobin value was below 12 mg/dL in 32 (29.4%) female patients, it was above the reference value in 77 (70.6%) patients. While the hemoglobin value was below 13 mg/dL in 22 (26.5%) male patients, it was above the reference value in 61 (73.5%) patients. 54 (28.1%) of the patients were in the anemic group, and 138 (71.9%) were in the non-anemic group (Table 1).

In the anemic group, of the 54 patients, 32 (59.3%) were female, and 22 (40.7%) were male; in the non-anemic group, of the 138 patients, 77 (55.8%) were female, and 61 (44.2%) were male. There was no statistically significant difference between the groups regarding gender distribution (p=0.663). The mean age was 56.4±8.5 years in the anemic group and 47.7±8.1 years in the non-anemic group. When the groups were compared in terms of age distribution, it was detected that the anemic group was older than the non-anemic group and the age difference was statistically significant (p<0.001, Table 1).

Type 1 hiatal hernia was detected in 39 (20.3%) patients, type 2 in 23 (11.9%) patients, type 3 in 118 (61.5%) patients and type 4 in 12 (6.3%) patients. There is a difference between the groups in terms of hernia types and this difference is due to the distribution of Types II, III, and IV (p=0.001, Table 1).

The CCI was used to evaluate the preoperative clinical conditions of the patients. The mean CCI score of the patients in the anemic group was 3.24±0.78, while that of the non-anemic group was 2.25±0.64. Thus, there was a significant difference in comparing the groups using the CCI score (p<0.001, Table 1).

According to serum iron, ferritin, and serum iron-binding capacity values, chronic disease anemia was not found in any of the patients. While there was a positive correlation between hemoglobin, serum iron, and ferritin levels of the patients, a negative correlation was found between serum iron-binding capacity and other values (p<0.001, Table 2).

Elective surgery was performed on all patients. All patients were initiated with laparoscopic technique, but four patients had laparotomy due to insufficient laparoscopic exploration. The rate of transition from laparoscopic surgery to conventional surgery was 2.1%. All of these four patients were in the anemic group.

The postoperative median time of hospital stay of the patients was 3 (range, 1-7) days. The median length of hospital stay was 3 (range, 2-7) days in the anemic group and 2 (range, 1-5) days in the non-anemic group. Thus, there was a statistically significant difference between the anemic and non-anemic groups regarding the length of hospital stay (p<0.001, Table 3).

Intraoperative bleeding was detected in five (2.6%) patients in total. Three (5.6%) of these patients were from the anemic group, and two (1.4%) patients were from the non-anemic group. Intraoperative blood transfusion was applied to four (7.4%) patients from the anemic group and two (1.4%) from the non-anemic group. When intraoperative bleeding and subsequent blood transfusion were compared, there was no statistically significant difference between the groups (p=0.136, and p=0.054, respectively, Table 3).

In the postoperative period, complications were observed in 35 (64.8%) patients in the anemic and 40 (28.9%) patients in the non-anemic group. Of the 35 patients in the anemic group who had complications, 22 (62.9%) had CD class I, 11 (31.4%) had class II, and 2 (5.7%) had class III complications. Class I complications were detected in 30 (75%), and class II complications were detected in 10 (25%) of the 40 patients who had complications in the non-anemic group. Thus, there was a significant difference between the groups regarding the proportion of postoperative complications, and it was found to be more common in the anemic group (p<0.001, Table 3).

Of the seven (3.6%) patients who needed postoperative intensive care, five (9.3%) patients were in the anemic group, and two (1.4%) were in the non-anemic group. Eight (14.8%) of ten (5.2%) patients who received a blood transfusion in the postoperative period were in the anemic group, and two (1.4%) patients were in the non-anemic group. Thus, there was a significant difference between the groups regarding the need for intensive care and blood transfusion in the postoperative period (p=0.020, and p<0.001, respectively, Table 3).

Table 1. Patients' demographics and preoperative factors

	Anemic (n=54)	Non-anemic (n=138)	p	All Patients (n=192)
Age (year), mean±SD	56.4±8.5	47.7±8.1	**<0.001**	50.1±9.1
Charlson comorbidity index, mean±SD	3.24±0.78	2.25±0.64	**<0.001**	2.53±0.81
Gender, n (%)				
Female	32 (59.3)	77 (55.7)	0.663	109 (56.8)
Male	22 (40.7)	61 (44.3)		83 (43.2)
Hernia Type, n (%)				
Type I	9 (16.7)	30 (21.7)	**<0.001**	39 (20.3)
Type II	11 (20.4)	12 (8.7)		23 (11.9)
Type III	26 (48.1)	92 (66.7)		118 (61.5)
Type IV	8 (14.8)	4 (2.9)		12 (6.3)

Table 2. Comparison of laboratory values

	Anemic (n=54)	Non-anemic (n=138)	p	All Patients (n=192)
Hemoglobin (mg/dL)	10.8±1.1	14.2±1.3	**<0.001**	13.2±1.9
Hematocrit (%)	81.5±10.5	84.9±6.8	**<0.001**	83.9±8.1
MCV (fl)	32.7±3.7	42.3±4.1	**<0.001**	39.6±5.9
Serum Iron (mg/dL)	51.2±12.9	121.3±34.9	**<0.001**	101.6±43.9
Ferritin (mg/L)	41.7±30.4	224.7±18.1	**<0.001**	173.2±130.7
FIBC (mg/dL)	318.5±50.2	212.9±76.1	**<0.001**	242.6±84.4

MCV: mean corpuscular volume, FIBC: free iron-binding capacity

Table 3. Perioperative and postoperative results

	Anemic (n=54)	Non-anemic (n=138)	p	All Patients (n=192)
Hospitalization time (day)	3 (1) [2-7]	2 (1) [1-5]	**<0.001**	3 (1) [1-7]
Intraoperative bleeding, n (%)	3 (5.6)	2 (1.4)	0.136	5 (2.6)
Intraoperative blood transfusion, n (%)	4 (7.4)	2 (1.4)	0.054	6 (3.1)
Postoperative complication, n (%)	35 (64.8)	40 (28.9)	**<0.001**	75 (39.1)
Clavien-Dindo scale, n (%)				
Stage I	22 (40.7)	30 (21.7)		52 (27.1)
Stage II	11 (20.4)	10 (7.2)	0.228	21 (10.9)
Stage III	2 (3.7)	0 (0.0)		2 (1.1)
Postoperative intensive care unit, n (%)	5 (9.3)	2 (1.4)	**0.020**	7 (3.6)
Postoperative blood transfusion, n (%)	8 (14.8)	2 (1.4)	**<0.001**	10 (5.2)

DISCUSSION

Sliding hiatal hernia, which is common in adults, is a result of weakened muscles and fascial tissues in the hiatal region (1). Conditions such as obesity, pregnancy, chronic cough, vomiting, and retching that increase positive intraabdominal pressure also predispose to hiatal hernia. When the hiatal hernia is symptomatic, an operation is required (2).

Although hiatal hernia surgery is mostly elective and clean field surgery; rarely, emergency operations may be required. For these reasons, complications during the perioperative period are desired to be prevented. Stauder et al. (14) reported that anemia is most common in advanced age. Anemia prevalence was found at 17% in a cohort case series of older adults over 65 years old, although it was lower at younger ages. Bleeding in patients with hiatal hernia is primarily chronic and leads to anemia. Bleeding may occur in 1/4 of the patients with hiatal hernia and GERD. Bleeding due to these diseases constitutes 10% of all acute and chronic upper gastrointestinal bleeding. The most common causes of bleeding related to hiatal hernia and GERD are gastric ulcers, erosive esophagitis, esophageal ulcers, peptic strictures, and Barrett's esophagus (15). In the present study, the patients were adults between the ages of 4 and 6 decades; the rate of anemia is 28.1%. Therefore, it was considered that the increase in the incidence of anemia was due to hiatal hernia. Although anemia was more common in females in this study, gender was not effective in anemia.

In a study conducted by Cheverie et al. (16), it was reported that hiatal hernia causes anemia, and anemia disappears at a rate of 50% after repair. Besides, Addo et al. (17) reported that Cameron ulcer healed, anemia disappeared, and the quality of life improved after hiatal hernia repair in patients with secondary chronic anemia. We investigated the extent of complications caused by anemia after hiatal hernia surgery, but the presence of stomach ulcers or anemia that stomach ulcers may cause was not discussed. However, it was reported by Hourani et al. (18) that this pathology, defined as Cameron ulcer, may cause anemia and even regress after the operation. The current study is a retrospective study, and the data are limited. Therefore, the presence of ulcers and the location of the ulcers in patients is not known. Furthermore, it has been shown that as the ulcer regresses with hiatal hernia repair, anemia can also be treated, and complications that may be caused by hiatal hernia can be prevented (19,20).

There is other literature showing the effect of the hiatal hernia type on the prevalence of anemia. While Hourani et al. (18) reported that the type of hiatal hernia affects the frequency of anemia, notably paraesophageal hernia, which causes anemia more frequently. Yu et al. (1) showed that there is no relationship between hernia type and anemia.

The present study considered that other causes of comorbidity might be together with anemia as the leading cause of comorbidity in patients. The patients were evaluated with CCI, and it was detected that there were other causes of comorbidity together with anemia. In a study by Che et al. (21), it was shown that more than one comorbid disease might coexist in patients with hiatal hernia. Also, it has been shown that the coexistence of more than one comorbid disease after hiatal hernia surgery may cause increased morbidity. In the study conducted by Chevrollier et al. (22), the CCI score was high in anemic patients. Similar results were obtained in terms of postoperative intensive care requirement, postoperative complication risk, and blood transfusion need both in the current study and in the study of Chevrollier et al. (22). It was detected higher in anemic patients.

In a study conducted by Trastek et al. (23), postoperative complications were observed in 18 (36.7%) patients after hiatal hernia repair, nine were significant, and nine were minor complications. In the current study, postoperative complications were observed in 65% of patients with preoperative anemia, 94% of these were class I and II, and 6% were class III. Thus, in anemic patients, it was observed that the rate of complication and the severity of complications support the literature, but the distribution of complications may vary.

After hiatal hernia repair, chronic anemia negatively affects the length of stay in the hospital and the need for intensive care (1). While preoperative anemia is a risk factor in increasing hospitalization duration after hiatal hernia surgery, it does not significantly affect intensive care needs.

This study has some limitations. Some studies on different gastrointestinal diseases other than hiatal hernia, preoperative anemia, and malnutrition data were collected together, and postoperative complications were evaluated accordingly (24). In their hiatal hernia study, Clark et al. (25) reported that anemia and malnutrition had separate effects on postoperative complications. Malnutrition

was not evaluated in this study, and only anemia was evaluated. Besides, we could not evaluate the relation of preoperative anemia with intraoperative bleeding, intraoperative and postoperative blood transfusion needed due to limited data. Due to the limited number of studies in the literature, prospective randomized controlled studies with more extensive patient series are needed to reach more precise and detailed data on this subject.

The limitations of the current study are its retrospective design, the small number of patients, the lack of a clear algorithm for surgical indications, the effect of intraoperative bleeding, and the lack of postoperative endoscopic recovery data.

CONCLUSIONS

Anemia, sometimes, might be the only finding for a hiatal hernia. Cameron ulcer, which is caused by a hiatal hernia and is the cause of anemia, regresses after the hernia repair. Anemia before hiatal hernia repair increases postoperative complications. When surgery is planned to treat asymptomatic hiatal hernia, anemia, or ulcers, care should be taken for postoperative complications caused by anemia.

Ethics Committee Approval: The study was approved by the Clinical Researches Ethics Committee of Okmeydanı Training and Research Hospital (20.02.2019, 57).

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