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Does emergency surgery have impact on lymph node harvest in colorectal cancer surgery?

Kolorektal kanser cerrahisinde, acil cerrahinin çıkarılan lenf nodu sayısına etkisi var mı?

Andrej Nikolovski [1], Kristijan Dervishov [1], Cemal Ulusoy [2]

Abstract

Aim: Adequate oncologic surgery for colorectal cancer implies proper resection margin of the resected specimen and complete mesocolic excision in order to achieve objective postoperative pathologic staging. Current recommendations require a minimum of 12 lymph nodes retrieval. In emergency colon cancer surgery, questions are raised about its impact on the lymph node number harvest. Aim of this study is to determine the impact of emergency colorectal cancer surgery on the lymph node number retrieval.

Methods: Retrospective analysis of 102 patients operated for colorectal cancer in the period of 1 year was conducted. Two groups (emergency and elective) were formed. Six surgeons performed all of the operations (three high-volume and three low-volume surgeons).

Results: Twenty patients presented as surgical emergencies and the rest 66 were elective cases. Sixteen patients with stage IV were excluded. Mean number of lymph nodes retrieved in the emergency group was 11.1 [5 - 20], and 14.7 [4 – 34] in the elective one, respectively ($p = 0.004$). Sufficient number of lymph nodes (≥ 12) extraction was achieved in 7 patients in the emergency group and in 48 patients in the elective one ($p = 0.003$).

Conclusions: Emergency colon cancer surgery did have impact on the lymph node number harvest. Adequate colorectal training is expected to improve the surgical technique in order to achieve reliable TNM staging.

Key words: colorectal cancer, emergency surgery, lymph node.

Öz

Amaç: Kolorektal kanserlerde postoperative doğru evreleme, yeterli onkolojik cerrahi, rezeke edilen spesmenin yeterli cerrahi sağlam sınırlarla çıkarılması ve komplet mezokolik eksizyon yapılmasını gerektirir. Günümüzde en az 12 lenf nodu çıkarılması önerilmektedir. Acil kolorektal cerrahinin çıkarılan lenf nodu sayıları üzerine etkileri hakkında sorular mevcuttur. Bu çalışmanın amacı, acil kolorektal kanser cerrahisinin çıkarılan lenf nodu sayısı üzerindeki etkisini belirlemektir.

Metod: 1 yıllık periyodda kolorektal kanser tanısıyla ameliyat edilmiş olan 102 hasta retrospektif olarak çalışmaya alınmıştır. İki grup (acil ve elektif) oluşturulmuştur. Ameliyatlar altı cerrah (üç yüksek volüm, üç düşük volüm) tarafından gerçekleştirilmiştir.

Bulgular: Yirmi hasta acil ve 66 hasta elektif ameliyat edilmiştir. Evre IV 16 hasta çalışma dışında tutulmuştur. Acil ameliyat edilen grupta çıkarılan ortalama lenf nodu sayısı sırasıyla 11.1 [5-20] ve elektif grupta 14.7 [4-34] dir ($p = 0.004$). Acil ameliyat edilen grupta 7 hastada, elektif ameliyat edilen grupta 48 hastada yeterli sayıda lenf nodu (≥ 12) çıkarılmıştır. ($p = 0.003$)

Sonuç: Acil kolon cerrahisinin çıkarılan lenf nodu sayısı üzerine etkisi vardır. Yeterli kolorektal cerrahi eğitiminin, cerrahi tekniği geliştirerek güvenilir TNM sınıflaması elde edilmesine etki etmesi beklenmektedir.

Anahtar kelimeler: Kolorektal kanserler, acil cerrahi, lenf nodu

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Introduction

Adequate oncologic surgery for colorectal cancer implies proper resection margin of the resected specimen and, at the same time, complete mesocolic dissection of the lymphatic drainage region in order to achieve objective postoperative pathologic staging. The current TNM staging of the American Joint Committee on Cancer (AJCC) requires a minimum of 12 lymph nodes for proper postoperative staging. Twelve or more lymph nodes need to be included according to the International Union for Cancer Control (UICC) [1]. Achievement of these recommendations allows further adequate additional oncologic therapy for the patients.

Questions are raised when emergency surgery for colon cancer is conducted due to the number of lymph node retrieval during the resection [2]. It is a challenging surgery because of the higher rate of morbidity, mortality and shorter disease-free survival [3-5]. In 24 – 29% of cases operated for colon cancer emergencies, a number of less than 12 lymph nodes yield are reported [6,7].

Material and methods

The study was conducted in accordance with the "Helsinki Declaration Principles". Ethics Committee approved this study. The local committe approved the study (the Ethics Committee of the University Surgery Clinic ''Sv. Naum Ohridski', approval date and number: 10.11.2021, 38/2021). Informed consent was not taken due to the retrospective nature of the study.

This single institution retrospective study analyzes the number of lymph node retrieval in patients operated for colorectal carcinoma and the impact of emergency surgery on the number, compared with the elective ones. Demographic data, tumor localization, type of surgery, postoperative tumor stage, number of procedures performed by single surgeon and number of patients in whom 12 ≥ lymph nodes were harvested in the specimen were analyzed. By comparing the acquired data from the two groups, the impact of the emergency surgery was tested for lymph node number yield adequacy. The number of the procedures per surgeon and its influence on the lymph node number was also analyzed.

Medical histories of patients operated for colon cancer in the past one year were analyzed. Inclusion criteria implied postoperative pathologic confirmation of colorectal adenocarcinoma with stage I-III in patients where tumor removal was performed with intention for a curative resection. Patients with Stage IV were excluded. Two groups (emergency and elective group, A and B respectively) were formed.

Six surgeons performed all of the operations, three with high volume (≥ 14 colorectal surgeries per year) performance and the rest three with less than 14 procedures per year. None of the surgeons finished official training in colorectal surgery due to the lack of that kind of educational program in the country. Three of the surgeons finished official training (sub specialization) in abdominal surgery and three were trained general surgeons. All the surgeons are performing emergency and elective colorectal surgery on routine basis in our clinic.

Depending on tumor location, right hemicolectomy, extended right hemicolectomy, left hemicolectomy, recto-sigmoid resection (with primary anastomosis or the Hartman's procedure), subtotal colectomy, anterior rectal resection (high and low), abdomino-perineal rectal resection, en-block resections of other involved organs and proctocolectomy were performed.

A retrospective review of the pathology reports was conducted. Institute for pathology analyzed all the removed specimens using the UICC TNM staging (8th edition) classification for colon and rectal cancer.

Statistical Analysis

Statistica for Windows software v. 10 was used. Variable normality was tested with Kolmogorov-Smirnof test. Student T test was used for numerical data analysis and Chi square and Fisher exact tests were used for attributive data depending on the sample size. A value of $p < 0.05$ was considered statistically significant.

Results

A total number of 102 patients with colorectal cancer (elective and emergency presentation) were operated in the period of 12 months. Sixteen of them (15.6%) presented with stage IV and were excluded from further analysis. Out of 86 patients, 20 (23.3%) presented as surgical emergencies (colon obstruction and perforation) and the rest 66 (76.3%) were elective cases. All the pathology reports confirmed colorectal adenocarcinoma. In one young female patient (23 years old), adenocarcinoma of the descendent colon was preoperatively confirmed on the basis of Familial Adenomatous Polyposis.

Emergency and elective group were formed for analysis (Table 1). Patient mean age was 67.5 years (range 23-87) of whom male were 51 (59.3%) and female were 35 (40.7%). There was no statistical difference between the two groups concerning the age and sex. Emergency group presented with 14 cases of colon obstruction and 6 cases of colon perforation. Understandably, most of the patients in the Emergency group presented with ASA score of 3 (Table 1).

Table 1. Patient data.

	Emergency group	Elective group	p
n	20	66	
Male/Female	9/11	42/24	0.13
Age mean (range)	66.2 (45 – 82)	67.9 (23 – 87)	0.5
Comorbidities			
Hypertension	9	25	0.56
Diabetes mellitus	4	9	0.48
Coronary disease	-	5	-
COPD	-	2	-
ASA class			
2	1	30	0.0009
3	18	36	0.004
4	1	-	-
Cause for emergency			
Obstruction	14	-	-
Perforation	6		

Statistical significance was defined as $p<0.05$, COPD: Chronic Obstructive Pulmonary Disease, ASA: American Society of Anesthesiologists

Tumor location was divided in 5 groups (right colon with hepatic flexure, transverse colon, left colon with splenic flexure, sigmoid colon with recto-sigmoid junction and rectum). No statistical difference between the two groups presented in terms of tumor location.

Tumor stage in the emergency group was advanced in 50% of cases (IIIB and IIIC). Similar, in the elective group, advanced stages presented in 33 patients (50%).

Resection margins were negative in all the emergency cases and in the elective group there was one patient with positive distal margin.

Type of surgery performed in both groups presented without statistical difference except the Hartman's procedure which was used in 40% of the emergency cases and only in 3.04% of the elective cases (p = 0.00001). Tumor site location, type of surgery and postoperative stage for both groups are shown in Table 2.

Surgeons 1, 2 and 3 (high-volume surgeons) performed 14- 21 surgeries, and surgeons 4, 5 and 6 (low-volume surgeons) performed 10- 12 surgeries. The number of procedures and lymph nodes harvested per surgeon are given in Table 3.

Analysis of different procedure due to tumor location in terms of lymph node sufficiency showed no statistical difference between the two groups. On the other hand, cumulative analysis of lymph node number sufficiency in both groups showed statistical difference favoring the elective procedures as the ones with higher number of retrieved lymph nodes form the mesocolon. Sufficient number of lymph nodes was achieved only in 7 (35%) patients in the emergency group contrary to the elective group with sufficient number reached in 48 (72.8%) patients (Table 4).

Table 2. Tumor location, type of surgery and postoperative stage.

Tumor location	Emergency Group n (%)	Elective Group n (%)	p
Right colon (with hepatic flexure)	4 (20 %)	20 (30.3%)	0.36
Transverse colon	2 (10%)	5 (7.5%)	0.72
Left colon (with splenic flexure)	4 (20%)	5 (7.5%)	0.11
Sigmoid (with recto-sigmoid junction)	10 (50%)	21 (31.9%)	0.16
Rectum	0 (0)	5 (22.8%)	
Type of surgery			
Right hemicolectomy	4 (20%)	19 (28.8%)	0.43
Extended right hemicolectomy	3 (15%)	5 (7.6%)	0.31
Left hemicolectomy	2 (10%)	3 (4.5%)	0.36
Subtotal colectomy with ileo-recto anastomosis	1 (5%)	2 (3.04%)	0.67
Sigmoid resection with anastomosis	1 (5%)	17 (25.7%)	0.04
Hartman's procedure	8 (40%)	2 (3.04%)	0.00 001
Anterior rectal resection (high and low)	-	9 (13.7%)	
Abdominoperineal rectal resection	-	4 (6.06%)	
Block-resection with other organs	1 (5%)	4 (6.06%)	0.85
Proctocolectomy with IPAA	-	1 (1.5%)	
UICC TNM staging (8th edition) Stage			
I	-	5	
II	-	3	
IIA	5	18	0.84
IIB	5	5	0.03
IIC	-	2	
IIIA	-	-	
IIIB	8	21	0.49
IIIC	2	12	0.38
Resection margin			
R0	20	65	-
R1	-	1	-

Statistical significance was defined as p<0.05, IPAA: Ileal Pouch Anal Anastomosis, UICC: Union for International Cancer Control, TNM: Tumor Node Metastasis.

Table 3. Number of procedures performed and lymph node number per surgeon.

Surgeon	Number of procedures (emergency/elective)	Mean number of lymph nodes	Range
1	17 (5/12)	13.2	[5-28]
2	21 (1/20)	14.6	[4-34]
3	14 (2/12)	13.8	[8-20]
4	12 (5/7)	14.2	[9-23]
5	10 (3/7)	13.3	[6-20]
6	12 (4/8)	14	[8-28]

Table 4. Lymph node number sufficiency.

Type of procedure	Emergency Group (n)	Elective Group (n)	p
Right hemicolectomy	11.5	15.4	0.07
Extended right hemicolectomy	11	18.8	0.09
Left hemicolectomy	8	12.6	0.28
Subtotal colectomy with ileo-recto anastomosis	16	17	0.77
Sigmoid resection with anastomosis	13	14.05	0.82
Hartman's procedure	11.1	9.5	0.64
Anterior rectal resection (high and low)	-	14.4	-
Abdominoperineal rectal resection	-	12.2	-
Block-resection with other organs	9	15	0.47
Proctocolectomy with IPAA	-	20	-
Sufficiency of lymph node number			
Mean ± SD [range]	11.1 ± 3.69 [5 - 20]	14.7 ± 5.2 [4 – 34]	0.004
Sufficient (≥ 12) (%)	7 (35%)	48 (72.8%)	0.003
Insufficient (< 12) (%)	13 (65%)	18 (27.2%)	

Statistical significance was defined as p<0.05, SD: Standard deviation.

After comparison of the number of lymph nodes in the two groups of surgeons (high and low volume ones), we found no statistical difference. The mean lymph node number for each single surgeon was above 12 (Table 5).

Table 5. High versus low volume surgeon lymph node number.

High vs. low volume surgeon	Number of lymph nodes (n ± SD)	Range	p
High volume	13.9 ± 5.46	[4 - 34]	0.94
Low volume	13.8 ± 4.84	[6 -28]	

Statistical significance was defined as p<0.05, SD: Standard Deviation

In terms of early postoperative mortality, there was one in-hospital death in a 73-years-old male patient from the elective group with ASA score 3 and diabetes mellitus.

Discussion

About 20% of the colorectal cancer cases are presented initially as an emergencies [8, 9]. Emergency colorectal surgery for colon cancer is demanding surgery due to the unprepared colon, the possibility for peritonitis and its advanced stage. Also, the patients often present with poor condition. Therefore, the influence on immediate surgical morbidity and mortality is strong [10]. Also, it is reported that long-term prognosis in these patients is worse [7, 11-15].

In our study, 20 patients presented as emergencies, classified mostly with ASA score of 3. Nevertheless, there was no mortality in the emergency group. It could be explained by the small sample. Also, most commonly performed operation (40%) in this group was the Hartman's procedure which in general consumes less time than a formal colon resection with primary anastomosis creation. Another additional answer is the absence of intestinal anastomosis in the procedure and the eliminated possibility of anastomotic leakage effects on the postoperative morbidity and mortality.

Among the factors that influence the lymph node number yield are tumor size, higher T-stage, male sex and age > 75 years [16, 17]. According to Barbas and Nicholl, advanced and specialized colorectal training are associated with higher lymph node retrieval and adequate lymphadenectomy for Stage II and III disease [18, 19]. In our study none of the surgeons completed colorectal training program. The only official training in our country is a 2 year training in abdominal surgery that covers the field of colorectal surgery.

Defining the appropriate single surgeon volume is still debatable. Most of the studies define their cut-offs based on the study sample. The cut-off ranges for low-volume surgeon are described to range from 1 procedure per 5 years, to 108 procedures per 1 year [20].

According to Unger et al., the pathologist's "dedication" can improve the lymph node detection in the removed specimen. Under "dedication", the author defines the pathologist as scientifically and clinically highly experienced in the field of colon cancer pathology [21]. The specimens of our series were analyzed by different pathologists, not all with "dedication" in the field of colorectal surgery.

Acar et al., report sufficient number of lymph nodes retrieved in the emergency and elective group in 76% and 73%, respectively (p = 0.576). In his series, a large number of emergency patients were encompassed with a higher single surgeon volume, contrary to our smaller series which could explain the statistical differences [7].

One the other hand, reports from USA confirm the inadequacy of the lymphadenectomy in 48% to 63% of the patients [22, 23]. Similar unsatisfying results are published by Johnson and Mitchell with non-reaching the 12 lymph nodes between 33% and 50% of the colorectal cases [24, 25]. Large population-based retrospective cohort study conducted in Ontario (Canada) reports sufficient lymph node yield in 72% of the operated patients [26]. Our study showed sufficient number of lymph node retrieval in more than 70% of the elective cases, while that number in the emergency group was lower.

It is described that tumor location influenced the number of lymph node number removal. According to Dillman, the highest average lymph node number was identified in lesions of the ascending colon (in 83.1% of cases) [27].

In the emergency group of our series, higher average number of lymph nodes was isolated in the sigmoid resections followed by the right hemicolectomy. On the other hand, highest number was achieved after extended right hemicolectomy in the elective group. Patients with subtotal colectomy and proctocolectomy were not included in this analysis due to the extended lymphatic drainage region that was dissected no matter the tumor location.

Regarding the single surgeon volume and its influence on the lymph node harvest, it would be expected that higher number of colorectal procedures per year will result in a higher number of lymph nodes extraction. However, Valsecchi et al. [28] have shown that there is no difference between the surgeons' experience and the lymph node number. Similarly, Jakub reports no statistical difference in the number of lymph nodes on basis of single surgeon volume. He also points trend for low volume surgeons (less than 10 procedures per year), to have more nodes extracted (p = 0.09) [29].

In our study, low volume surgeons (less than 14 colorectal procedures per year) did not have worse results in terms of lymph node yield when compared to the high volume ones. All of them performed at least 10 colorectal procedures per year and this can be the explainable reason for the absence of statistical difference in the two groups.

Limitations of this study were as follows: it was a single-center retrospective study; the number of patients included wass relatively small; cases of colon and rectal cancer were not analyzed separately.

In conclusion, this study showed that 50% of both, elective and emergency cases presented in advanced stage of the disease. Single surgeon volume did not affect the lymph number harvest. Tumor location did not influenced the lymph node harvest in both groups. Emergency surgery showed statistically significant impact on the lymph node number retrieval. It is expected that the introduction of adequate colorectal training program might have positive effect on the improving of the surgical skills, thus resulting in better lymph node yield, reliable postoperative staging, adequate indications for adjuvant therapy and better outcome in patients presented as colorectal emergencies.

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Choledochoduodenostomy for failed endoscopic treatment of common bile duct stones: Both traditional and current method

Ana safra kanalı taşlarının başarısız endoskopik tedavisi için koledokoduodenostomi: Hem geleneksel hem de güncel olan bir yöntem

Mehmet Can Aydın[1], Oğuzhan Özşay[1], Kağan Karabulut[2]

Abstract

Background: The gold standard current treatment for common bile duct (CBD) stones is stone extraction via endoscopic retrograde cholangiopancreatography (ERCP). In ERCP failed cases, alternative surgical treatment methods come to the fore. Choledochoduodenostomy (CDD), which is a traditional method, is one of them. We aimed to present our conventional CDD results in ERCP failed patients.

Methods: Between March 2015 and February 2022, clinicodemographics, perioperative findings, and postoperative results of 23 ERCP failed patients with underwent CDD for CBD stones were analyzed retrospectively.

Results: The median age was 71 (41-85), and 13 (56%) were female. Of the patients, 5 (21%) had cholecystectomy and 7 (30%) had gastrectomy + gastroenterostomy, previously. The most common presenting symptom was abdominal pain (39%). The median number of failed ERCPs was 1 (1-6), and the reasons for failure were gastroenterostomy in seven patients, impacted stones in nine, multiple and/or large stones in six, and papillary opening anomaly in one. The median CBD diameter was 15 (10-40) mm. The median operation time was 120 (60-240) minutes, and no perioperative complication developed. The median length of hospital stay was seven (4-14) days. In the early postoperative period, wound infection was observed in two (8%) patients, and evisceration was observed in one (4%). There was no mortality. The mean follow-up period was 27 (2-77) months, and incisional hernia was encountered in 2 (8%) patients in the late postoperative period. There was no evidence of Sump syndrome within the follow-up period.

Conclusion: In treatment of ERCP failed CBD stones, CDD is an effective and safe surgical treatment method in selected patients.

Keywords: choledochus, common bile duct exploration, obstructive jaundice.

Öz

Amaç: Koledok taşlarının altın standart güncel tedavi yöntemi endoskopik retrograd kolanjiopankreatografi (ERCP) ile taş çıkarılmasıdır. Bunun başarısız olduğu durumlarda alternatif cerrahi tedavi yöntemleri ön plana çıkmaktadır. Geleneksel bir yöntem olan koledokoduodenostomi (CDD) de bunlardan biridir. Biz de ERCP'nin başarısız olduğu hastalardaki konvansiyonel CDD sonuçlarımızı sunmayı amaçladık.

Yöntemler: Mart 2015 ve Şubat 2022 tarihleri arasında ERCP ile tedavi edilemeyen koledok taşı olan ve konvansiyonel koledok eksplorasyonu, taş çıkarılması ve CDD uygulanan 23 hastanın klinikodemografik verileri, perioperatif bulguları ve postoperatif sonuçları retrospektif olarak analiz edildi.

Bulgular: Hastaların ortanca yaşı 71 (41-85) olup, 13'ü (%56) kadındı. Hastaların 5'inde (21%) geçirilmiş kolesistektomi, 7'sinde (30%) gastrektomi + gastroenterostomi ameliyatı öyküsü vardı. En sık başvuru semptomu karın ağrısıydı (39 %). Başarısız ERCP sayısı ortanca bir (1-6) olup, başarısızlık nedenleri yedi hastada gastroenterostomi olması, dokuz hastada impakte taş olması, altı hastada taş boyutu ve sayısının fazla olması, bir hastada papilla açılım anomalisiydi. Hastaların ortanca koledok çapı 15 (10-40) mm'di. Operasyon süresi ortanca 120 (60-240) dk olup, perioperatif komplikasyon gelişmedi. Yatış süresi ortanca yedi (4-14) gündü. Postoperatif erken dönemde iki (8%) hastada yara yeri enfeksiyonu, bir (4%) hastada eviserasyon görüldü. Mortalite izlenmedi. Hastaların ortalama takip süresi ortanca 27 (2-77) aydı ve geç dönemde iki (8%) hastada insizyonel herni ile karşılaşıldı. Sump sendromuna ait bulgular hiçbir hastamızda gözlenmedi.

Sonuç: ERCP ile çıkarılamayan koledok taşlarının tedavisinde CDD seçilmiş hastalarda efektif ve güvenli bir cerrahi tedavi yöntemidir.

Anahtar Kelimeler: ana hepatik kanal eksplorasyonu, koledok, obstrüktif sarılık.

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Introduction

Common bile duct (CBD) stones are mostly secondary to the falling of gallbladder stones into the bile duct, and their frequency is increasing, especially in elderly patients [1,2]. This may cause complications with high morbidity such as jaundice, cholangitis and pancreatitis, and requires treatment. Currently, the standard treatment for CBD stones is the laparoscopic cholecystectomy following extracting the stones via endoscopic retrograde cholangiopancreatography (ERCP) [3,4]. However, in ERCP failed cases, other treatment methods should be performed [5]. Choledochoduodenostomy (CDD) is one of these, and despite increasing surgical experience, it has been maintaining its safety area for many years.

CCD was first performed by Riedel in 1888 [6]. Over time, with the increasing experience in endoscopic and laparoscopic treatments, this method has rarely been used. These rare conditions include previous gastroenterostomy, impacted stones, large and/or multiple stones, peripapillary diverticulum, or papillary opening anomaly, which causes ERCP failure [1]. In addition, Sump syndrome, an extremely rare complication that causes fear of surgeons, has further reduced the use of CDD [7]. In this study, we aimed to present the results of our patients underwent CDD, after failed ERCPs for CBD stones.

Material and methods

The present study was approved by the local ethics committee of Ondokuz Mayıs University (2022/186). Between March 2015 and February 2022, 23 patients with CBD stones who underwent CDD due to failed ERCPs were included in the study. The patients who had T-tube drainage, primary suture or hepaticojejunostomi were excluded. And patients with malignancy and with benign biliary stenosis were excluded. The indications were failure of ERCP, due to CBD stones, for all these patients. The diameter of the CBD was over 10 mm in all (Figure 1). The data of the patients including age, gender, body mass index, American Society of Anesthesiologists Score, previous cholecystectomy and upper abdominal surgery, main presenting symptom, number of failed ERCPs, CBD size (imaging with Magnetic Resonance Cholangiography), percutaneous treatment, operation time, count and diameter of extracted stones operatively, technical details of the anastomosis, early and late postoperative complications, and findings in the follow-up period, were examined.

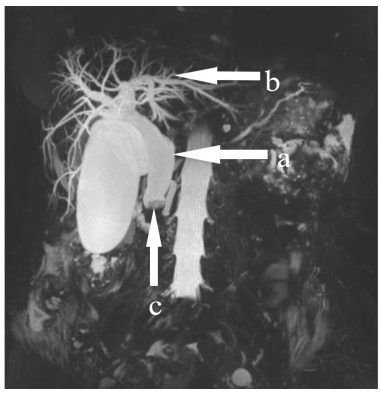

Figure 1. Magnetic resonance cholangiography imaging of a patient before choledochoduodenostomy. (a) Common bile duct diameter is larger than 10 mm, (b) intrahepatic bile ducts are markedly dilated, and (c) impacted stone in the distal part of common bile duct.

The operations were performed by 3 hepatopancreaticobiliary surgeons. Informed consent was obtained from all patients. After the right subcostal or Makuuchi incision, duodenal mobilization was fully achieved by performing the Kocher maneuver for a tension free anastomosis. Cholecystectomy was performed if previously not, routinely. After suspending sutures in the distal common bile duct, a longitudinal 2 cm choledochotomy and duodenotomy were performed from the most distal part of the CBD (supraduodenal region). CBD stones were extracted and, bile duct was irrigated with saline. Proximal and distal parts of the CBD were checked via stone forceps or cholangiography, for stone clearance. The passage was checked from the choledochus to the duodenum via a bougie. PDS or Prolen monofilament sutures (4.0-5.0) were used continuously or interrupted for the single-layer anastomosis (Figure 2). An abdominal drain was placed under the CDD, routinely.

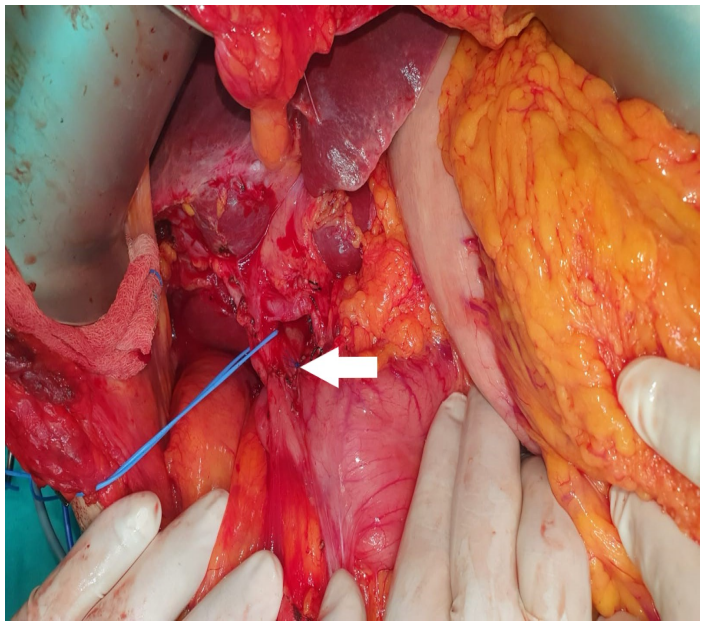

Figure 2. The image of tension free anastomosis of choledochoduodenostomy (marked with the arrow).

Antibiotic prophylaxis was used as 3rd generation of Cephalosporin before the operation. The nasogastric drain was removed and the oral diet was started on the postoperative 3rd day. The drain was removed when the amount was below 100 cc/day, and than paitents were discharged. While the postoperative first 30 days were defined as the early period, the following days were long-term. Long-term outcomes were recorded through clinical reports at outpatient follow-up and hospital readmissions. Sump syndrome is defined as recurrent cholangitis and liver abscess due to stones, sludge, or debris accumulating in the CBD reservoir. Ultrasonography and magnetic resonance cholangiography were performed to evaluate stone recurrence.

All statistical analyses were performed with IBM SPSS Statistics 26 (IBM, Armonk, NY, USA). The normality of the distribution of continuous variables was tested by Shapiro–Wilk test. Normally distributed continuous variables were expressed as mean ± standard deviation. Non-normally distributed continuous variables were expressed as median and range. Categorical data was described as frequencies with percentages.

Results

Clinicodemographic characteristics and previous medical histories of the patients are shown in Table 1.

Table 1. Preoperative findings of the patients

Age. median (range)	71 (41-85)
Gender, female, n (%)	13 (56.5%)
BMI <25 kg/m^2, n (%)	12 (52.5%)
ASA score 3, n (%)	11 (47.8%)
Previous upper abdominal surgery	
Laparoscopic cholecystectomy	5 (21.7%)
Conventional gastrectomy	7 (30.4%)
Laparoscopic hiatal hernia repair	1 (4.3%)
Main presenting symptom, n (%)	
Abdominal pain	9 (39%)
Nausea and vomiting	5 (21.7%)
Jaundice	6 (26%)
Cholangitis (fever with jaundice)	3 (13%)
CBD diameter, mm, median (range)	15 (10-40)
Failed ERCP, median (range)	1 (1-6)
Failed percutaneous treatment, n (%)	7 (30.4%)

BMI: Body mass index, ASA: American Society of Anesthesiologists, CBD: Common bile duct, ERCP: Endoscopic retrograde cholangiopancreatography.

The median number of failed ERCPs was 1 (1-6). The reasons for failure were impacted stones in nine patients, failure due to previous gastroenterostomy in seven, inability to clear the stones because of large size and/or multiple stones in six, and papillary opening anomaly in one. The main reason for trying ERCP in previous gastroenterostomy group was that the type of gastric surgery (Billroth 1 or 2) that had been performed a long time ago at another center was not clearly known. After failed ERCPs, treatment via percutaneous transhepatic catheter was tried in seven patients. In five of these, the stones could not be removed or pushed into the duodenum because of their large size (Figure 3), one could not be adequately positioned due to scoliosis, and in one, intrahepatic bile ducts were not dilated enough and the procedure was failed.

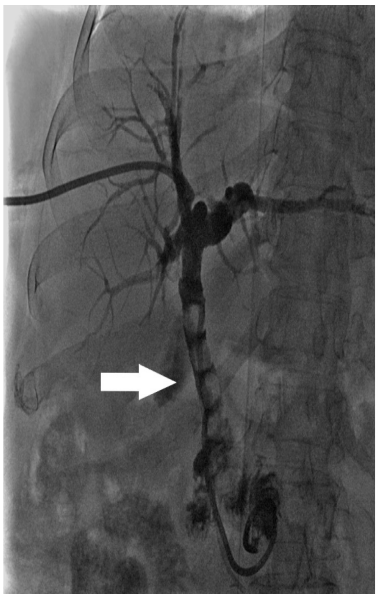

Figure 3. Failed percutaneous treatment due to large stones (marked with the arrow) in the common bile duct.

The perioperative findings and postoperative results of the patients are shown in Table 2.

Table 2. Perioperative findings and postoperative outcomes of the patients.

Operation time (min), median (range)	120 (60-240)
Anastomosis technique	
Continuous, n (%)	14 (60.9%)
Interrupted, n (%)	9 (39 %)
Extracted stones, n (%)	
Multiple / Single	18 (78.3%) / 5 (22.7%)
Milimetric / Cantimetric	9 (36.1%) / 14 (63.9 %)
Length of hospital stay (day), median (range)	7 (4-14)
Postoperative complications, n (%)	
Early period, n (%)	3 (13%)
Wound infection	2
Evisceration	1
Long term period, n (%)	2 (8.6%)
Incisional hernia	2
Follow-up (months), median (range)	27 (2-77)

In the early postoperative period, complications developed in three patients (13%): two had wound infections and were treated conservatively; one was re-operated due to evisceration. No bile leakage or cholangitis was observed. The median follow-up period was 27 (2-77) months. Incisional hernia developed in two (8.6%) patients in the long-term follow-up. Sump syndrome and stone recurrence were not detected in any of them.

Discussion

CBD stones are often associated with cholelithiasis, and they are secondary to these stones falling into the CBD [1]. Rarely, they can also be seen as primary stones due to infection or stasis [8]. CBD stones are generally seen more in the elderly age and female gender, similar to our cohort, and occur in a broad clinical perspective ranging from asymptomatic to pancreatitis and recurrent cholangitis [9]. Therefore, accurate diagnosis and effective treatment are critiacal in these patients. The current treatment strategy is accepted as ERCP + laparoscopic cholecystectomy [3, 4]. However, in ERCP failed cases, surgical treatment alternatives may be required. These alternatives are choledochotomy + primary suture or T-tube drainage, choledochoduodenostomy and hepaticojejunostomy with stone extraction. We treated some of our ERCP failed patients with CBD stones, performing CDD which is one of these surgical methods, and we did not experience any major complications in the early and late postoperative periods.

In addition to being minimally invasive and highly successful in treatment of CBD stones, ERCP may sometimes fail for various factors. These factors include impacted stones, large and/or multiple stones that do not allow stone clearance, cannulation difficulty due to duodenal diverticulum or papillary opening anomaly, and gastroenterostomy history [10, 11]. Repeated ERCP attempts due to the failure may cause negative results such as re-administration of general anesthesia and an increased risk of complications. In our study group, there were 10 patients who had more than one repeated ERCPs. Considering all these risks and reviewing our results, we think it would be more

appropriate to treat this patient group surgically instead of repeated ERCPs.

While the postoperative morbidity of CDD is approximately 10-28% [12], the most feared complication is Sump syndrome. Sump syndrome is defined as recurrent cholangitis and liver abscess after CDD due to stones, sludge, or debris accumulating in the CBD reservoir distal to the anastomosis [13]. However, this rate is about 2,5% in the literature, which is quitely rare [7, 11, 12]. Perhaps this exaggerated fear drives surgeons away from the idea of performing CCD. Recommendations of previous studies to prevent the development of Sump syndrome are that the anastomosis diameter should not be narrow, the papilla should be dilated, and the transition to the duodenum should be confirmed [9, 14]. We attribute that we have never encountered this complication in our long-term follow-up due to following all the recommendations. As a result, we think that this almost abandoned method can be a good alternative surgical technique when performed in selected patients and with the correct principles.

Technical details affecting the long-term success of CCD are based on a few points in the literature. These are performing the choledochotomy from the most distal part possible, mobilizing the duodenum by performing the Kocher maneuver for tension-free anastomosis, choledochotomy, and duodenotomy line being at least 2 cm long [15]. Additionally, side-to-side anastomosis is more preferred because it is more practical and less morbid than end-to-side anastomosis [3]. All anastomosis in our cohort was: at least 3 cm long; as near as duodenum possible and side-to-side.

Studies have shown that CDD can be performed minimally invasively with technological development and increasing laparoscopic surgical experience [9, 16]. The benefits of minimally invasive surgery are undoubted, but the current technique requires appropriate operating room personnel, surgical instruments, and advanced laparoscopy experience. Unfortunately, not all centers can provide these facilities. We also think that laparoscopic CCD can be a more beneficial method for patients in centers where appropriate conditions are provided.

The limitations of our study were the small number of patients and its retrospective nature.

In conclusion, CDD is a safe and effective treatment for ERCP failed CBD stones in selected patients. The surgeons should keep ideal technical recommendations in mind for better postoperative results.

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Effect of COVID-19 pandemic on surgical treatment of inguinal hernia: A retrospective study in a single center

COVID-19 pandemisinin inguinal herni cerrahi tedavisi üzerindeki etkisi: Tek bir merkezde retrospektif bir çalışma

İbrahim Ethem Cakcak[1], Mert Kaptan[1]

Abstract

Aim: In this study, we aimed to examine the effect of the COVID 19 pandemic on the number, complication rates and epidemic characteristics of patients operated with the diagnosis of inguinal hernia in our institute.

Methods: We analyzed all patients who underwent inguinal hernia operation in Trakya University Faculty of Medicine, Dept of General Surgery, between March 11, 2019, and March 11, 2020, and compared them with the cases between March 11, 2020, and March 11, 2021, retrospectively. Percentages, mean, standard deviation, median and interquartile range were used as the descriptive statistics. Mann-Whitney U test was used for the variations which are contrary to the normal distribution range in the comparison of two groups. The relations between qualitative variations were studied by the Pearson Chi-Square test and Fisher's Exact test. Significant value was determined as 0.05 for all statistical analyses.

Results: Between March 11, 2019, and 2020, 65 patients were operated on (Group 1), and 26 patients between March 11, 2020, and 2021 (Group 2). The percentage of female patients was significantly higher in Group 2 (4.6% in Group 1, 23.1% in Group 2, p=0.008) and there was a statistically significant increase in the rate of incarceration and strangulation in Group 2 (44.6% in Group 1, 84.6% in Group 2, p=0.001).

Conclusions: During the COVID-19 pandemic the incarceration and strangulation rate was higher. The increase in complication rates can be attributed to the relative decrease in elective surgeries or the increase in the number of female patients admitted during the COVID period.

Keywords: Inguinal Hernia, COVID, strangulation, incarceration, surgery.

Öz

Amaç: Bu çalışmada, enstitümüzde kasık fıtığı tanısı ile ameliyat edilen hastaların sayısı, komplikasyon oranları ve epidemik özellikleri üzerine COVID 19 pandemisinin etkisini incelemeyi amaçladık.

Yöntemler: 11 Mart 2019-11 Mart 2020 tarihleri arasında Trakya Üniversitesi, Tıp Fakültesi Genel Cerrahi Anabilim Dalın'nda kasık fıtığı ameliyatı olan tüm hastaları geriye dönük olarak inceleyerek 11 Mart 2020-11 Mart 2021 tarihleri arasındaki olgularla karşılaştırdık. Tanımlayıcı istatistiksel değerlendirme olarak ortanca, çeyrek değerler; yüzde ve frekans oranları verildi. İki grubun karşılaştırılmasında normal dağılım aralığına aykırı varyasyonlar için Mann-Whitney U testi kullanıldı. Niteliksel varyasyonlar arasındaki ilişkiler Pearson Ki-Kare testi ve Fisher'in kesin testi ile incelendi. Tüm istatistiksel analizler için anlamlı değer p≤0,05 olarak belirlendi.

Bulgular: 11 Mart 2019 – 2020 tarihleri arasında 65 hasta (Grup 1), 11 Mart 2020 – 2021 (Grup 2) arasında 26 hasta ameliyat edildi. Kadın hasta oranı Grup 2'de anlamlı olarak daha yüksekti (Grup 1'de %4,6, Grup 2'de %23,1, p=0,008) ve Grup 2'de inkarserasyon ve strangülasyon oranında istatistiksel olarak anlamlı bir artış vardı (Grup 1'de %44,6, Grup 2'de %84,6, p=0,001).

Sonuç: COVID-19 salgını sırasında inkarserasyon ve strangülasyon oranı daha yüksekti. Komplikasyon oranlarındaki artış, elektif ameliyatların göreceli olarak azalmasına veya covid döneminde başvuran kadın hasta sayısının artmasına bağlanabilir.

Anahtar Kelimeler: İnguinal herni, COVID, strangülasyon, inkarserasyon, cerrahi.

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Introduction

Coronavirus 2019 (COVID-19) is a highly contagious respiratory infection caused by a new virus, acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). On March 11, 2020, the outbreak of COVID-19 was declared a pandemic by the World Health Organization (WHO) [1, 2]. Symptoms of this viral pneumonia include fever, cough, and chest discomfort, as well as dyspnea and bilateral lung infiltration in severe instances.[3]. Because of the virus's high infectious potential, hospitals around the globe quickly became overburdened with the number of infected patients and their need for respiratory assistance. As a result, numerous countries declared states of emergency and recommended their citizens to stay at home, while hospitals were recommended to cancel elective surgeries [4-6]. These factors combined with the fear of COVID-19 led to a fewer number of ER visits but an increased complication rate of emergency surgeries such as acute appendicitis [7, 8].

Inguinal hernia is one of the most performed abdominal surgeries with more than 10 million performed all around the globe every year. Incarceration of the hernia happens when the contents of the hernia get trapped within it and cannot return to their original position. The symptoms of the incarceration, which is mostly pain and discomfort, depends on the hernia's pathological effects on the physiological function of the trapped part. If the trapped part's blood flow is cut off the part becomes strangulated.[9]. A noteworthy factor for developing complicated inguinal hernia is the time between the beginning of the symptoms and admission to the hospital [10, 11].

With the beginning of the COVID-19 pandemic, admission to hospitals with abdominal emergencies such as incarcerated hernias decreased significantly [12, 13]. While some articles reported a serious decrease in emergency surgeries and the number of incarcerated hernias, some reported an increase in the number of incarcerated hernias during the pandemic [14,15].

In this study, we compared the inguinal hernia surgeries and the rate of incarceration within those cases in 1 year period after the declaration of COVID-19 as a pandemic to compare it with the same duration of time before March 11, 2020, to see if the COVID-19 pandemic had any effect on emergency inguinal hernia surgeries.

Material and methods

Study

This single-center retrospective study included the period between 11 March 2019 and 11 March 2020 as the pandemic period (Group 1) and between 11 March 2020 and 11 March 2021 (Group 2) in Trakya University Faculty of Medicine, Department of General Surgery, Edirne, Turkey. The study included all patients who were operated for inguinal hernia in the General Surgery Clinic of the Trakya University Hospital. This study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (Protocol Code: Protocol code: TÜTF-GOBAEK 2022/175).

The data of only emergency operated patients were analyzed by reviewing the hospital system. We exclude the patients who were under 18 years old or had hernias other than an inguinal hernia. Patients presenting with symptoms of mechanical intestinal obstruction, incarceration and/or strangulation were urgently operated, while patients with a history of incarceration in the pandemic period or severe pain who did not have an indication for emergency surgery were operated electively. The single-center study and the small number of patients studied can be cited as the limitations of this study.

Patients' age, gender, length of stay, surgical procedure, and presence of incarceration were recorded. The data were compared between Group 1 and 2.

Statistical Analysis

Percentages, mean, standard deviation, median and interquartile range were used as the descriptive statistics. Categorical data were analyzed with Pearson's Chi-Square and Fisher's Exact test to compare between categories expressed as numbers while Student's T-Test and Mann-Withney U Test were used for continuous variables. Statistical significance was shown as P value <0.05 and all results were expressed with a confidence interval of 95%. G-Power program to perform our Post-Hoc power analysis. The calculated effect size of the study group was 0.523. With 0.523 effect size, Df=1 and a significance value of p<0,05, the power of the study was calculated as 0.998. All statistical analyses were performed with the TURCOSA (Turcosa Analytics Ltd Co, Turkey, www.turcosa.com.tr) statistical software program.

Results

Number of Inguinal Hernia Cases

Between March 11, 2019, and 2021, a total of 110 patients were administered to our hospital for inguinal hernias. Of those, 19 patients were excluded from our research because of misdiagnosis. Of the remaining 91, 65 patients were operated on before March 11, 2020, and 26 patients were operated on during the first year of COVID-19 Pandemic.

Pre-operative Characteristics

Between the groups, there was no significant difference of median ages (59 for Group 1, 62 for Group 2). Although there was a statistically significant increase in female patients in Group 2, (23%) when compared with the Pre-Pandemic Group 1 (5%) with a p-value of P=0,008. Indirect inguinal hernia rates in Group 1 and Group 2 were 52%- 46%, direct inguinal hernia rates were 35%- 30%, respectively, while femoral hernia rates were 12% and 23% (p<0.005). Most importantly when the incarceration rate was compared between groups there was a statistically significant increase in Group 2(85%) compared to Group 1(56%). The demographic and clinical data of Group 1 and Group 2 are summarized in Table 1.

Operative and Post-operative Characteristics

Regarding surgical interventions, there was no significant difference between conventional and laparoscopic approaches when groups are compared (10 laparoscopic, 55 conventional operations in Group 1, and 4 Laparoscopic, 22 conventional operations in Group 2, p=1.000). There were no post-operative deaths in both groups. When compared, there was no significant difference between mean Length of stay between groups (2.86 ± 2.03 days for Group 1 and 2.15 ± 0.78 days for Group 2, p=0.208).

Discussion

In our study, designed to see if the COVID-19 pandemic had any effect on inguinal hernia surgeries, we found that there was a significant increase in the rate of incarceration seriously. We found that during the first year of the COVID-19 pandemic, the rate of incarceration was surprisingly increased from 56% to 85% when compared with the previous year.

Table 1. Demographic and clinical characxteristics of the groups.

		Group I (Pre-Pandemic) (n=65)	Group II (Pandemic) (n=26)	p
Age (year) †		59 (22-85)	62 (28-89)	0.662
Sex ‡	Male	62 (95.4)	20 (76.9)	0.008
	Female	3 (5.6)	6 (23.1)	
Length of stay (day) §		2.86 ± 2.03	2.15 ± 0.79	0.208
Reductable ‡		36 (55.4)	4 (15.4)	
Incarceration ‡		29 (45.6)	22 (85.6)	0.001
Approach ‡	Conventional	55 (84.6)	22 (84.6)	1.000
	Laparoscopic	10 (15.4)	4 (15.4)	

†: median (range), ‡: n (%), §: mean standard deviation

There is a relative decrease in the number of operations in our center which was consistent with the studies conducted by Surek et al.[13], Lima et al. [14], and Kurihara et al. [16]. The decrease in the number of operations may be due to the authorities' encouragement to stay at home, the cancellation of elective surgeries, and patients' fear of contracting the virus and getting infected. Additionally, the increase of incarceration rate is most likely due to delayed admission to the hospital probably caused by same factors that led to the decrease in the surgeries.

The high number of female patients and femoral hernias during the COVID period can also be shown as the reason for the increase in the rate of incarceration. It is known that femoral hernias are high risk group among inguinal hernias and are frequently associated with complications [17]. Femoral hernia rate of 3% among inguinal hernias constitutes a small part of elective operations. However, with incarceration and strangulation, the rate of femoral hernia can reach up to 20-40% in emergency applications. In the study of Glassow et al. [18], covering a period of 17 years and 2105 patients with femoral hernia, it is shown that the rate of femoral hernia in women increased up to 38%. As a result, femoral hernia and indirectly female gender are thought to constitute a risk group for emergency incarcerated hernia operations when compared with elective operations [17].

Surprisingly, the data we studied showed that significantly more women were operated on for inguinal hernia during the pandemic than the previous year. This might be caused because being a female is a risk factor on its own for complicated hernia and it might increase the chances of complications in an event where the hospital admission is already delayed [10, 11]. But our patient groups are too small to make such assumptions. With a larger study group, this parameter could be researched better.

In our post-operative data, we found that the length of stay in our hospital was longer in the Pre-Pandemic group. This data contradicts with research done for abdominal surgeries such as colorectal surgeries conducted by Changzheng et al. [8] and the study studying complicated appendicitis conducted by Marie Burgard et al. [19] where length of stay at hospitals were longer during the pandemic. It can be assumed that, because there is an additional risk of contracting COVID-19 infection, patients were more likely sent home sooner than the pre-pandemic group to eliminate any further risk recommended by guidelines [4-6].

We can list the existing limitations in our study as follows; being single-centered, retrospective, and small sample size. We used the data of a single hospital limited to between March 11, 2019, and March 11, 2021. Choosing a longer period of time as the control group might have led to different results. The curfew during the pandemic and the underestimations of symptoms by the patient or general practitioners could have led to a fewer number of patients but most of our patients were already in conservative follow-up period by our surgeons so we believe who did not admit to our hospitals were relatively low.

In conclusion, in our study, COVID-19 pandemic caused a decrease in both elective and emergency hernia surgery but a significant increase in the incarceration rate. The small sample size and retrospective design are the limitations of our study. It will be useful to reveal a clearer surgical planning calendar in order to reduce our rate of encountering complicated cases in pandemic situations such as covid, thanks to prospective and larger series studies to be carried out in the future.

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Significance of novel hematologic inflammatory parameters in predicting aortic valve sclerosis

Aort kapak sklerozunun öngörülmesinde yeni hematolojik inflamatuar parametrelerin önemi

Özge Çakmak Karaarslan[1], Funda Başyiğit[1]

Abstract

Aim: Inflammatory process plays a critical role in the progression of aortic valve sclerosis (AVS). This study aims to evaluate the haematological and biochemical inflammatory markers in AVS patients.

Methods: A retrospective observational study was included consecutive 557 patients who underwent an echocardiogram between June 2021 and September 2021. The study population was divided into two groups according to the presence of AVS. The groups were compared in terms of C-reactive protein (CRP), Neutrophil-lymphocyte ratio (NLR), platelet-lymphocyte ratio (PLR), and monocyte-HDL cholesterol ratio (MHR).

Results: The mean age was 63 ± 10 years. C-reactive protein (CRP), NLR, PLR and MHR were significantly higher in patients with AVS. The best cut-off values of the NLR were 1.4 (a sensitivity of 84%, a specificity of 74%), PLR was 116 (a sensitivity of 75%, a specificity of 54%), and MHR was 9.5 (a sensitivity of 78%, a specificity of 75%). CRP (OR: 1.246, 95% CI: 1.117 – 1.389; p < 0.001), NLR (OR: 2.10, 95% CI: 1.456 – 3.032; p < 0.001), and MHR (OR: 1.227, 95% CI: 1.125 – 1.339; p < 0.001) were independent predictors of the AVS when NLR and MHR analysed as a continuous variable. Using a cut off level of NLR > 1.4 (OR: 4.825, 95% CI: 2.430 – 9.583; p < 0.001) and MHR > 9.5 (OR: 13.937, 95% CI: 7.464 – 26.023; p < 0.001) were independent predictors of the AVS.

Conclusion: Increased CRP levels, NLR and MHR were found to be independent predictors for AVS. Hematological inflammatory biomarkers are cost effective and helpful approach for prediction of AVS presence.

Keywords: aortic valve sclerosis, C-reactive protein, monocyte count to high-density lipoprotein cholesterol ratio, neutrophil-to-lymphocyte ratio, platelet-to lymphocyte ratio

Öz

Giriş: İnflamatuvar süreç, aort kapak sklerozunun (AKS) ilerlemesinde kritik rol oynar. Bu çalışma, AKS hastalarında hematolojik ve biyokimyasal inflamatuar belirteçleri değerlendirmeyi amaçlamaktadır.

Yöntemler: Bu çalışma retrospektif, tek merkezli olup, Haziran 2021 ile Eylül 2021 arasında ekokardiyogram yapılan ardışık 557 hasta dahil edildi. Çalışma popülasyonu AKS varlığına göre iki gruba ayrıldı. Gruplar C-reaktif protein, Nötrofil-lenfosit oranı (NLR), trombosit-lenfosit oranı (PLR) ve monosit-HDL kolesterol oranı (MHR), değerleri açısından karşılaştırıldı.

Bulgular: Çalışmaya alınan hastaların ortalama yaşı 63 ± 10 yıl olarak bulundu. AKS izlenen hastalarda C-reaktif protein (CRP), NLR, PLR ve MHR anlamlı olarak daha yüksekti. NLR için en iyi kesme değerleri 1.4 (duyarlılık %84, özgüllük %74), PLR için 116 (duyarlılık %75, özgüllük %54) ve MHR için 9,5 (duyarlılık %78, özgüllük %75) olarak tespit edildi. CRP (OR: 1.246, %95 CI: 1.117 – 1.389; p < 0,001), NLR (OR: 2.10, %95 GA: 1.456 – 3,032; p < 0.001) ve MHR (OR: 1,227, %95 CI: 1,125 – 1,339; p < 0.001) AKS nun bağımsız öngördücüleri olarak bulundu. İlaveten veriler kategorik değişken olarak analiz edildiğinde, NLR > 1,4 değeri (OR: 4,825, %95 GA: 2,430 – 9,583; p < 0.001) ve MHR > 9,5 değeri (OR: 13,937, %95 GA: 7,464 – 26,023; p < 0,001) AKS için bağımsız öngördürücü olarak bulundu.

Sonuç: Artan CRP seviyeleri, NLR ve MHR, AKS için bağımsız öngördücüler olarak tespit edildi. Hematolojik inflamatuar biyobelirteçler, AKS varlığının öngörülmesi için uygun maliyetli ve faydalı parametreler olarak önemlidir.

Anahtar Kelimeler: aort kapak sklerozu, C-reaktif protein, monosit sayısı ile yüksek yoğunluklu lipoprotein kolesterol oranı, nötrofil-lenfosit oranı, trombosit-lenfosit oranı

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Introduction

Aortic valve sclerosis (AVS) is defined as the thickening of the aortic valve without a hemodynamically significant obstruction of the left ventricular outflow [1]. Several studies have shown that age, diabetes mellitus (DM), hypertension (HT) and hyperlipidaemia (HPL) are risk factors for AVS [2]. AVS includes multiple pathological similarities to the atherosclerotic process and the prognostic value of AVS is explained by its strong relationship to atherosclerotic risk factors [3, 4]. Numerous studies have confirmed that inflammatory process plays an important role in the beginning and progression of both coronary atherosclerotic disease and AVS [5].

It has been shown that small elevations of systemic inflammatory markers are associated with atherosclerotic arterial plaques in general populations [6]. Additionally, it has known that inflammation markers have elevated in AVS, and valve degeneration has associated with the severity of inflammation [7]. There has been strong attention to inflammatory biomarkers in atherosclerotic cardiovascular diseases since they give information about diagnostic assessment, risk stratification, and straightforward evaluation in practice clinical routine. The most common utilized inflammatory parameters involve C-reactive protein (CRP), neutrophil-to-lymphocyte ratio (NLR), platelet-to lymphocyte ratio (PLR) and monocyte count to high-density lipoprotein cholesterol (HDL-C) ratio (MHR) [6, 8]. In this study, we aimed to evaluate haematological and biochemical inflammatory markers in patients with AVS.

Material and methods

Participants

The retrospective observational study was included consecutive 557 patients who underwent an echocardiogram between June 2021 and September 2021 admitted to our hospital cardiology outpatient clinics. AVS was defined as calcification and thickening of a trileaflet aortic valve with an aortic velocity of <2 m/sec. Patients with AF, aortic velocity ≥2 m/sec, severe valvular heart disease, bicuspid aortic valve, heart failure with reduced ejection fraction (Left ventricular ejection fractions ≤ 40%), glomerular filtration rate (GFR) ≤ 15 ml/min, history of acute rheumatic fever, connective tissue disease, cancer and missing clinical data were excluded. The study patients were divided into two groups based on the presence of AVS.

The Human Ethics Committee of our medical institution has been approved of this retrospective observational study protocol (Date: 20.04.2022, Number: E1-22-2559).

The baseline clinical and demographic characteristics for patients were obtained from the medical record. Transtoracic echocardiogram (TTE) (Philips Affiniti 50) was performed on all patients by two experienced cardiologists who had no knowledge of the clinical status of the patients. The interventricular septal thickness (IVST), left ventricular posterior wall thickness (PWT), left ventricular end-diastolic diameter (LVEDD) and ascending aorta diameter were calculated on the parasternal long-axis. Left ventricular ejection fractions (LVEF) were measured by applying biplane Simpson's method. We evaluated left ventricular diastolic dysfunction (LVDD) according to the update published by the current guidelines [9]. We assessed AVS from parasternal long, parasternal short views, and apical five chamber view. The presence of AVS was confirmed without using tissue harmonic imaging to avoid high gain settings [10]. We defined AVS as central regions of increased echogenicity and thickening of aortic valve leaflets without the restriction of motility and peak velocity of lower than 2.0 m/sec.

Peripheral blood samples were drawn to evaluate complete blood cell count, fasting blood glucose (FBG), triglyceride, low-density lipoprotein cholesterol (LDL-C), HDL-C, total cholesterol, urea, creatinine, albumin levels, total protein and CRP. Complete blood cell count was analyzed by an auto analyzer (Coulter LH 780 Haematology Analyzer, Beckman Coulter Corp., Hileh, FL) within 10-30 minutes after blood sampling and blood chemistry parameters were performed at the biochemistry laboratory of the health center. FBG, creatinine, urea, total cholesterol, HDL-C, LDL-C, triglyceride, and CRP were measured by conventional methods.

The NLR was calculated by dividing the number of neutrophils by the number of lymphocytes, the PLR was calculated by dividing the platelet count to the lymphocyte count and MHR was calculated by dividing the monocyte count to the HDL-C.

Statistical analysis

All data were examined with the SPSS 22.0 statistical software package for Windows (SPSS; IBM, Armonk, New York, USA). A Kolmogorov–Smirnov test was used for the evaluation of the normality of distribution. Continuous variables were submitted as mean ± standard deviation ıf a normal distribution or median ± interquartile ranges ıf a skewed Distribution without and categorical variables as the numeral and percentages of subject. The comparisons among the subjects were performed with a Student t test for normally distributed variables and a Mann–Whitney U test for variables without a normal distribution. Categorical variables from study population were analyzed utilization the $\chi 2$ or Fisher's exact test. Multivariate logistic regression analysis were used to evaluate the association between hematological and biochemical inflammatory markers and AVS. The ability of the NLR, PLR, MHR and CRP values to estimation the AVS were separately evaluated by a receiver operating characteristic curve and area under curve (AUC) values. The optimum cut-off values for NLR, PLR, and MHR were evaluated using the Youden index. A p-value lower 0.05 (using a two-sided test) was accepted as significant.

Results

A total of 557 patients who underwent echocardiogram constituted the study population. Baseline clinical, demographic characteristics and echocardiographic finding of the study population were presented in Table 1. The mean age was 63 ± 10 years, and male gender ratio was 48.8% in the study group patients. We divided the patients into two groups according to detection of AVS (AVS +, n= 119) or not (AVS -, n= 438). Patients with AVS had a higher prevalence of prior myocardial infarction (MI) ($p < 0.001$), previous cerebrovascular accident (CVA) ($p < 0.001$), DM ($p < .001$), HT ($p < 0.001$), HPL ($p < 0.001$), known diagnosis of heart failure ($p < 0.001$), history of peripheral arterial disease ($p < 0.001$), and known coronary artery disease ($p < 0.001$) compared to the patients without AVS. In echocardiographic findings, mean LVEF was 60% ± 2% in the patient without AVS and 55% ± 11% in the patients with AVS. Compared to the patients without AVS, LVEDD ($p = 0.001$), IVST ($p < 0.001$), PWT ($p < 0.001$), ascending aortic diameter ($p < 0.001$) were higher in the patients with AVS. There were no differences between the groups regarding aortic valve jet velocity. On the other hand, compared to the patients without AVS, patients with AVS were higher LVDD rates (Table 1).

White blood cell (WBC) counts ($p = 0.001$), monocyte counts ($p < 0.001$), neutrophil counts ($p < 0.001$), FBG ($p = 0.042$), LDL-C ($p = 0.010$), HDL-C ($p < 0.001$), total cholesterol ($p <$

0.001), urea (p < 0.001), creatinine (p < 0.001), CRP (p < 0.001), NLR (p < 0.001), PLR (p< 0.001) and MHR (p < 0.001) were significantly higher in patients with AVS as shown in Table 2.

Table 1. Baseline clinical, demographic characteristics and echocardiographic finding of the study population.

	All Group (n=557)	AVS – (n =438)	AVS + (n =119)	p-value
Age (year)	63 ± 10	62 ± 9	66 ± 11	0.002
Male, n (%)	272 (48.8)	191 (43.6)	81 (68.1)	<0.001
Prior MI, n (%)	94 (16.9)	54 (12.3)	40 (33.6)	< 0.001
Previous CVA, n (%)	36 (6.5)	16 (3.7)	20 (16.8)	< 0.001
Diabetes mellitus, n (%)	137 (24.6)	87 (19.9)	50 (42)	<0.001
Hypertension, n (%)	406 (72.9)	292 (66.7)	114 (95.8)	<0.001
Hyperlipidemia, n (%)	268 (48.2)	187 (43.1)	76 (67.9)	<0.001
Known diagnosis of heart failure, n (%)	54 (9.7)	23 (5.3)	31 (26.1)	<0.001
History of PAD, n (%)	65 (11.7)	30 (6.8)	35 (24.9)	<0.001
Known CAD, n (%)	159 (28.5)	94 (21.5)	65 (54.6)	<0.001
	Echocardiographic findings			
LVEF, %	60 ± 5	60 ± 2	55 ± 11	< 0.001
LVEDD, cm	4.6 ± 0.3	4.6 ± 0.3	4.7 ± 0.5	0.001
IVST, cm	1.2 ± 0.2	1.1 ± 0.2	1.3 ± 0.2	<0.001
PWT, cm	1.0 ± 0.1	1.0 ± 0.1	1.1 ± 0.2	<0.001
Aortic velocity, m/sec	1.2 ± 0.3	1.2 ± 0.3	1.3 ± 0.4	0.245
Asc. aorta diameter	3.5 ± 0.4	3.4 ± 0.3	3.6 ± 0.4	<0.001
LVDD, n (%)	321 (57.6)	226 (51.6)	95 (79.8)	<0.001

Continuous data are expressed as percentage, mean± standard deviation, or median± interquartile ranges. Categorical data are expressed as number (percentage)
MI: Myocardial infarction; CVA: Cerebrovascular accident; PAD: Peripheral arterial disease; CAD: Coronary artery disease; LVEF: Left ventricular ejection fraction; LVEDD: Left ventricular end-diastolic diameter; IVST: Interventricular septal thickness; PWT: Posterior wall thickness; LVDD: Left ventricular diastolic dysfunction.

The ability of the NLR, PLR, MHR and CRP to predict AVS were evaluated by ROC curve analysis. The AUC value of this analysis is presented in Figure 1.The AUC for the NLR was 0.773 (95% confidence Interval [CI]: 0.712 – 0.834, p < 0.001), the AUC for the PLR was 0.728 (95% CI: 0.668 – 0.787, p < 0.001), the AUC for the MHR was 0.789 (95% CI: 0.747 –0.830, p < 0.001) and the AUC for the CRP was 0.640 (95% CI: 0.580 – 0.699, p < 0.001). According to the Youden index for predicting of AVS, the best cut-off values of the NLR was 1.4 (with a sensitivity of 84%, a specificity of 74%), PLR was 116 (with a sensitivity of 75%, a specificity of 54%), and MHR was 9.5 (with a sensitivity of 78%, a specificity of 75%) (Figure 1).

The presence of DM (odds ratio [OR]: 2.142, 95% CI: 1.117 – 4.108; p = 0.022), HT (OR: 8.365, 95% CI: 2.353 – 29.736; p = 0.001), HPL (OR: 3.114, 95% CI: 1.612 – 6.016; p = 0.001) and CRP (OR: 1.246, 95% CI: 1.117 – 1.389; p < 0.001), NLR (OR: 2.10, 95% CI: 1.456 – 3.032; p < 0.001), and MHR (OR: 1.227, 95% CI: 1.125 – 1.339; p < 0.001) were independent predictors of the AVS when NLR and MHR analysed as a continuous variable (Model 1). Using a cut off level of NLR > 1.4 (OR: 4.825, 95% CI: 2.430 – 9.583; p < 0.001) and MHR > 9.5 (OR: 13.937, 95% CI: 7.464 – 26.023; p < 0.001) were independent predictors of the AVS (Model 2) (Table 3).

Table 2. Laboratory findings of the patients with aortic value sclerosis (AVS) and the patients without AVS.

	All Group (n=557)	AVS – (n =438)	AVS + (n =119)	p-value
WBC (x10³/ µL)	7.0 ± 2.2	6.8 ± 1.8	7.3 ± 2.7	0.001
Monocyte (x10³/ µL)	0.4 ± 0.1	0.3 ± 0.1	0.4 ± 0.2	<0.001
Neutrophil (x10³/ µL)	4.1 ± 1.5	3.9 ± 1.3	5.1 ± 2.9	<0.001
Lymphocyte (x10³/ µL)	2.1 ± 1.0	2.1 ± 0.8	1.5 ± 1.0	<0.001
Platelet (x10³/ µL)	259 ± 78	260 ± 80	249 ± 66	0.578
Hemoglobin (mg/dL)	13.8 ± 1.5	13.8 ± 1.4	14.1 ± 2.4	0.401
FBG (mg/dL)	98 ± 20	98 ± 20	97 ± 28	0.042
Triglycerides (mg/dL)	143 ± 105	151 ± 106	132 ± 105	0.631
LDL-C (mg/dL)	124 ± 47	125 ± 49	107 ± 41	0.010
HDL-C (mg/dL)	46 ± 15	48 ± 15	38 ± 11	<0.001
Total cholesterol (mg/dL)	201 ± 45	204 ± 45	189 ± 43	<0.001
Urea (mg/dL)	33 ± 12	32 ± 11	37 ± 13	<0.001
Creatinine (mg/dL)	0.8 ± 0.3	0.8 ± 0.2	0.9 ± 0.3	<0.001
Albumin (g/dL)	44 ± 3	44 ± 3	44 ± 5	0.011
Total Protein (g/dL)	69 ± 4	69 ± 5	68 ± 7	0.002
C-reactive protein (mg/L)	6 ± 4	5 ± 4	7 ± 4	<0.001
NLR	1.8 ± 1.0	1.75 ± 0.7	3.25 ± 4.1	<0.001
PLR	120 ± 64	114 ± 54	164 ± 120	<0.001
MHR	7.9 ± 3.7	7.3 ± 3.4	10.9 ± 3.7	<0.001

WBC: White blood cell; FBG: Fasting Blood Glucose; LDL-C: low density lipoprotein cholesterol; HDL-C: High density lipoprotein cholesterol; NLR: Neutrophil-to-lymphocyte ratio; PLR: Platelet-to lymphocyte ratio; MHR: Monocyte count to high-density lipoprotein cholesterol ratio.
Continuous data are expressed as percentage, mean ± standard deviation, or median ± interquartile ranges.

Table 3. The independent predictors of aortic value sclerosis (AVS) in multivariate analysis.

	OR (95% CI)	p value
MODEL 1		
Diabetes	2.142 (1.117 – 4.108)	0.022
Hypertension	8.365 (2.353 – 29.736)	0.001
Hyperlipidemia	3.114 (1.612 – 6.016)	0.001
CRP	1.246 (1.117 – 1.389)	<0.001
NLR	2.101 (1.456 – 3.032)	<0.001
PLR	1.004 (0.996 – 1.012)	0.309
MHR	1.227 (1.125 – 1.339)	<0.001
MODEL 2		
Diabetes	1.865 (0.999 – 3.480)	0.050
Hypertension	8.054 (2.900 – 22.367)	<0.001
Hyperlipidemia	3.678 (2.001 – 6.761)	<0.001
CRP	1.233 (1.113 – 1.365)	<0.001
NLR >1,4	4.825 (2.430 – 9.583)	<0.001
PLR >116	0.782 (0.342 – 1.788)	0.560
MHR >9,5	13.937 (7.464 – 26.023)	<0.001

CRP: C-Reactive Protein; NLR: Neutrophil-to-lymphocyte ratio; PLR: Platelet-to lymphocyte ratio; MHR: Monocyte count to high-density lipoprotein cholesterol ratio.

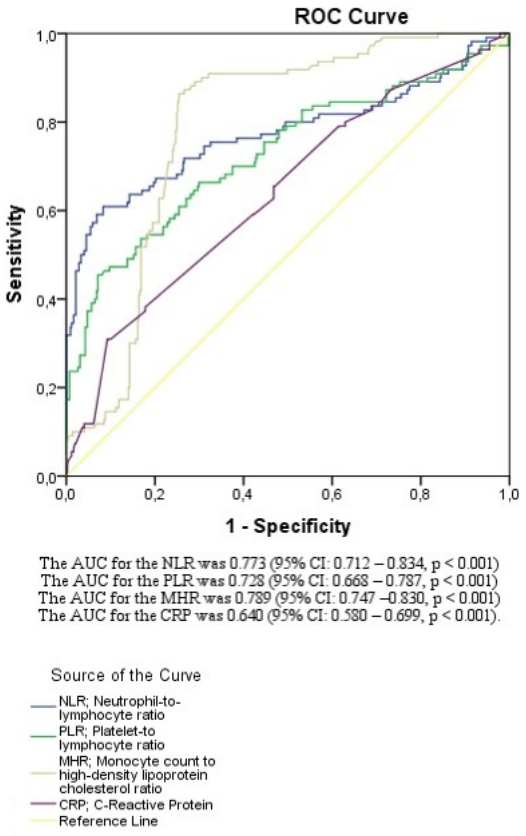

Figure 1. The receiver-operating characteristic curve analysis of the neutrophil-to-lymphocyte ratio (NLR), platelet-to lymphocyte ratio (PLR), monocyte count to high-density lipoprotein cholesterol ratio (MHR) and C-reactive protein (CRP) for predicting AVS.

Discussion

The major results of our report involve that (1) there are higher inflammatory markers in patients with AVS and (2) CRP, NLR and MHR are significant and independent predictors of AVS. This is the first study evaluation the inflammatory condition and haematological and biochemical paramarkers in patients with AVS.

AVS is closely connected with atherosclerosis. AVS has prognostic significance due to its close relationship with atherosclerotic heart diseases. In this study, patients with AVS were higher atherosclerosis risk factors such as CVA, DM, HT, HPL, and peripheral arterial disease compared to in patients without AVS. Previous studies have been suggested that AVS may be a "window" on coronary arteries, which could aid identifying patients in the pre-clinical stage of the disease [11]. It was not surprising that patients with AVS had a higher ratio of prior MI, previous CVA, and known coronary artery disease in this study.

AVS has been shown to resemble atherosclerosis in many ways: AVS has been associated with well-known traditional atherosclerosis risk factors; it shares similar inflammatory pathways with atherosclerosis [3]. As in atherosclerosis, the pathophysiology of AVS includes inflammation, blood pressure, fluid shear stress, high blood lipid and cholesterol levels, fibrosis, and calcification [12]. Increased mechanical stress and decreased shear stress cause valve endothelial dysfunction, lipid penetration and inflammation [13]. Inflammatory cells including neutrophils, monocytes and lymphocytes accumulate in the damaged tissue, produce numerous pro-inflammatory cytokines and cause degenerative processes resulting in fibrosis and calcification [14, 15]. NLR, PLR, and MHR have been indicated as possible markers to identify inflammation in cardiac and non-cardiac disorders [16, 17]. In additional, it has been reported CRP has been stored and localized together with LDL-C and macrophages in atherosclerotic plaque [18]. Our finding has shown that hematologic inflammatory markers such as NLR, PLR, MHR, and CRP were significantly higher in the patients with AVS compared to the patients without AVS. On the other hand, multivariate analysis showed that aortic valve sclerosis was independently associated with CRP, NLR and MHR levels whereas PLR was not independent predictors of aortic valve sclerosis.

Hematologic parameters can be used to predict progression and establish the clinical significance in AVS patients. In addition, hematologic parameters are low-cost and practically measurable laboratory factors in clinical practice.

NLR is simply measured by dividing neutrophil to lymphocyte in a complete blood count. It has been known that it is one of the best evaluated haematological biomarkers, which provides prognostic information in atherosclerotic events. Therefore, its importance in cardiovascular diseases has been investigated widely in recent years [19]. The combination of neutrophil and lymphocyte counts has a stronger prognostic significance than each theirs separately [20]. Recently, it has been shown that both patients with severe aortic stenosis and patients with severe mitral stenosis had an elevated NLR compared to patients with moderate and mild aortic or mitral stenosis [21]. In this study, NLR was significantly higher in patients with AVS and NLR was an independent predictor of aortic valve sclerosis.

PLR is calculated by dividing the platelet count to the lymphocyte count. PLR is a significant marker of two diverse inflammatory pathways simply calculated from a complete blood count [19]. PLR has been shown as an important marker in various cardiovascular diseases such as stable coronary artery disease, acute coronary syndrome, heart failure and valvular heart diseases [22]. Platelets and lymphocytes trigger the secretion of acute phase proteins that task as inflammation mediators [23]. It has been reported that PLR was strongly correlated with a transaortic mean pressure gradient in patients with aortic stenosis, and higher PLR was closely related to the severity of calcific aortic stenosis [24]. In our finding, PLR was a higher in patients with AVS. However, PLR was not reached statistical significance in multivariate regression analysis.

In recent studies, it has shown that the MHR is a significant indicator in cardiovascular diseases [25]. It has been reported that MHR with its strong correlation with CRP, also a predictor of atherosclerotic progress and worse outcomes in cardiovascular disease associated with inflammatory condition [17]. However, to our knowledge, no information is available on the relationship between MHR and AVS. In this study, MHR was significantly higher in patients with AVS and MHR was reached statistical significance in multivariate regression analysis. MHR, both continuous variable and categorical variable, was established to be a significant predictor of AVS.

Jeevanantham et al. [26] shown that CRP levels were significantly associated with the early stage of aortic valve disease. It was reported that the patients with rapid aortic stenosis progression were elevated CRP levels compared to patients with slow aortic stenosis progression [15]. On the contrary, some studies also have shown a weak relationship between CRP and aortic sclerosis [27]. In this study, CRP was significantly higher in patients with AVS, and CRP was a significant predictor of aortic valve sclerosis.

Our findings are similar to other studies showing that other significant predictors, such as DM, HT and HPL in particular, is also associated with AVS [2, 10].

This study has several limitations. The small number of patients limited the power of the study. All the data were based on a single measurement. We did not grade aortic valve calcification based on echocardiography. AVS was not evaluated quantitatively.

In conclusion, it is important that recent studies confirmed AVS as a marker for increased cardiovascular risk and increased cardiac adverse events [28]. Our study showed that haematological inflammatory biomarkers were elevated in patients with AVS. In addition, increased NLR, MHR and CRP levels were found to be independent predictors for AVS in our study. We believe that our findings are valuable like novel researchs' about AVS. Because using haematological inflammatory biomarkers is cost effective and helpful approach for prediction of AVS presence. Further studies with prospective design including larger patient populations are needed to substantiate these findings.

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Anesthesia management in patients with abnormally invasive placenta: A single-center experience

Plasental invazyon anomalisi olan hastalarda anestezi yönetimi: Tek merkez deneyimi

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Abstract

Aim: Postpartum hemorrhage is a life-threatening obstetric emergent clinical situation accompanied by blood loss of more than 500 ml after vaginal delivery and more than 1000 ml after cesarean section. This situation, frequently encountered in placental adhesion anomalies, is essential in terms of follow-up, treatment, and multidisciplinary management. We aimed to retrospectively evaluate the perioperative anesthesia management, transfusion requirement, and postoperative intensive care unit requirement of patients diagnosed with placental invasion anomaly who had an intraoperative hemorrhage

Methods: In our single-center study, a total of 58 female patients diagnosed with of placental invasion anomaly with a cesarean section between 2017-2020 were examined. Patients under 18 years of age and missing data were excluded from the study. Demographic data of patients (age, American Society of Anesthesiologists score (ASA)), diagnosis, duration of operation, perioperative laboratory findings, anesthesia type, perioperative hemodynamics (highest heart rate, lowest mean arterial pressure, shock index), amount of bleeding, blood products, and fluids used, surgical interventions (B-Lynch, Bacri balloon application, uterine artery ligation, hysterectomy), intraoperative vasopressor/inotrope use, ICU stay, laboratory results in the first 24 hours postoperatively, and total hospital stay were recorded.

Results: In the preoperative evaluation, 27 (46.5%) patients were diagnosed with placenta accreta, and placenta previa was diagnosed in 19 (32.7%) patients. Perioperatively mean of 3.08 ± 1.7 units of Red blood cell was used. In patients with postoperative intensive care unit hospitalization, the highest intraoperative lactate value was 3.5±1.8 mmol/L, shock index was 1.3±0.3 (0.6-1.8). In patients given intraoperative fibrinogen concentrate, the intraoperative shock index was 1.5±0.2 (0.9-1.8), the amount of intraoperative bleeding was 2575±302.2 ml, and the fibrinogen levels measured in the first 24 hours after surgery were 294.7±79.7 mg/dl.

Conclusions: Anesthesia management of patients diagnosed with abnormal placental invasion is important because of significant hemorrhage. Due to unstable hemodynamics, preoperative blood product preparation with a multidisciplinary approach and a postoperative intensive care unit plan should be made for these patients.

Keywords: Fibrinogen, intensive care units, postpartum hemorrhage, placental invasion anomaly, transfusion.

Öz

Amaç: Doğum sonu kanama, vajinal doğum sonrası 500 ml'den fazla, sezaryen sonrası 1000 ml'den fazla kan kaybının eşlik ettiği hayatı tehdit eden acil obstetrik bir klinik durumdur. Plasental adezyon anomalilerinde sıklıkla karşılaşılan bu durum takip, tedavi ve multidisipliner yönetim açısından önemlidir. Plasental invazyon anomalisi tanısı konan ve intraoperatif kanaması olan hastaların perioperatif anestezi yönetimi, transfüzyon gereksinimi ve postoperatif yoğun bakım gereksinimini retrospektif olarak değerlendirmeyi amaçladık.

Yöntemler: Tek merkezli çalışmamızda 2017-2020 yılları arasında sezaryen ile plasenta invazyon anomalisi tanısı alan toplam 58 kadın hasta incelendi. 18 yaş altı ve eksik verisi olan hastalar çalışma dışı bırakıldı. Hastaların demografik verileri (yaş, Amerikan Anestezistler Derneği skoru (ASA), tanı, operasyon süresi, perioperatif laboratuvar bulguları, anestezi tipi, perioperatif hemodinami (en yüksek kalp hızı, en düşük ortalama arter basıncı, şok indeksi), kanama miktarı, kan ürünleri ve kullanılan sıvılar, cerrahi girişimler (B-Lynch, Bacri balon uygulaması, uterin arter ligasyonu, histerektomi), intraoperatif vazopressör/inotrop kullanımı, yoğun bakımda kalış, postoperatif ilk 24 saat laboratuvar sonuçları ve hastanede toplam kalış süresi kaydedildi.

Bulgular: Ameliyat öncesi değerlendirmede 27 (%46,5) hastaya plasenta akreata, 19 (%32,7) hastaya plasenta previa tanısı konuldu. Perioperatif ortalama 3,08 ± 1,7 ünite eritrosit süspansiyonu kullanıldı. Ameliyat sonrası yoğun bakımda yatan hastalarda en yüksek intraoperatif laktat değeri 3.5±1.8 mmol/L, şok indeksi 1,3±0,3 (0,6-1,8) idi. İntraoperatif fibrinojen konsantresi verilen hastalarda; intraoperatif şok indeksi 1,5±0.2 (0,9-1,8), intraoperatif kanama miktarı 2575±302,2 ml ve ameliyat sonrası ilk 24 saatte ölçülen fibrinojen seviyeleri 294.7±79,7mg/dl bulundu.

Sonuç: Anormal plasental invazyon tanısı konulan hastalarda anestezi yönetimi, belirgin kanama nedeniyle önemlidir. Stabil olmayan hemodinami nedeniyle bu hastalarda multidisipliner yaklaşım, preoperatif kan ürünü hazırlığı ve postoperatif yoğun bakım planı yapılmalıdır.

Anahtar Kelimeler: Fibrinojen, yoğun bakım ünitesi, doğum sonu kanama, plasental invazyon anomalisi, transfüzyon.

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Introduction

Pathological attachment of the placenta to the myometrium is defined as abnormal invasive placentation (AIP). AIP is divided into three groups according to the depth of invasion; placenta accreta (PA) (placental villi are in direct contact with myometrium), placenta increta (PI) (placental villi invaded myometrium), placenta percreta (placental tissue crosses the serosa and penetrates adjacent structures including the bowel and bladder) [1].

In AIP cases, hemodynamics can be severely impaired due to intraoperative bleeding, and massive blood transfusion is often required. Many complications such as uterine rupture, bowel and bladder injury, and the need for a postoperative intensive care unit (ICU) may ocur in cases of AIP. In addition, AIP is the most common cause of peripartum hysterectomies [2].

Postpartum hemorrhage (PPH) is a life-threatening obstetric emergent clinical situation accompanied by blood loss of more than 500 ml after vaginal delivery and more than 1000 ml after cesarean section. It can occur in the first 24 hours after birth; or between 24 hours and 12 weeks after birth [3]. It is seen in 1-4% of all births and ranks in the top 5 among the conditions that cause maternal deaths worldwide [4, 5]. PPH may emerge after vaginal delivery or cesarean section, either as an early or a late complication of several obstetric conditions, including uterine atony, placental retention, abnormalities of placentation, and placenta previa (PP). Furthermore, PP is frequently complicated by the invasion of placental villi beyond the decidua basalis, causing placenta accreta or increta, referred to as placenta accreta spectrum (PAS) disorders.

The activation of physiological mechanisms can limit postpartum bleeding. However, despite the contraction of the myometrium and the activation of intravascular hemostatic factors, it may not be possible to control the bleeding. Therefore, managing anesthesia applications with pharmacological and surgical methods for bleeding prevention is vitally important [6].

In the presence of significant bleeding, it may be necessary to determine the amount of bleeding, the need for massive transfusion, the early introduction of shock protocols, and to apply for advanced surgical procedures.

The shock index (SI), calculated by dividing heart rate by systolic blood pressure (HR/SBP) in trauma and sepsis patients, is used as an indicator of hemodynamic instability and hypovolemia. This parameter can be more helpful than any standard vital parameter for estimating the need for intensive care in women with PPH. The normal range for non-pregnant adults is 0.5 to 0.7, and an SI of >0.9 has been associated with increased mortality [7]. In PPH patients, SI <0.9 was specified as a safe range, and SI ≥1.7 level was stated to require urgent intervention [8].

Fibrinogen and antifibrinolytic agent (tranexamic acid) applications also have an important place in the management of bleeding. The average level of fibrinogen in term pregnancy is 350 to 650 mg/dL, which is almost twice that of non-pregnant adults (200 to 400 mg/dL) [9]. A fibrinogen level >200 mg/dL in pregnant women is considered the minimum required level for adequate coagulation. It is recommended that attempts be made to increase the fibrinogen level to >300 mg/dL in cases of active bleeding and resuscitation [10]. There is now a focus on the importance of fibrinogen replacement during significant hemorrhage [11].

In our study, we aimed to retrospectively evaluate the perioperative anesthesia management, transfusion requirement, and postoperative intensive care (ICU) condition of patients with postpartum hemorrhage.

Material and methods

Study

The files of the cases who underwent cesarean section with the diagnosis of placental invasion anomaly between 2017 and 2020 were retrospectively reviewed. This study was a cross-sectional study. Ethical approval for this study was provided by the Ethical Committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey on, 16 September 2021 (Ethical number: 2021/270). The study was planned by the Helsinki Declaration and revised in Brazil in 2013. Informed consent was not obtained from the patients because the study was retrospective and only medical data were shared, and no personal information of the patients was shared.

Patients

The number of patients determined in the study was determined according to the data obtained from the retrospectively scanned files. During the study period, sixty-one patients over the age of 18 were identified from the scanned files. Unfortunately, three patients were excluded from the study due to missing data (Figure 1).

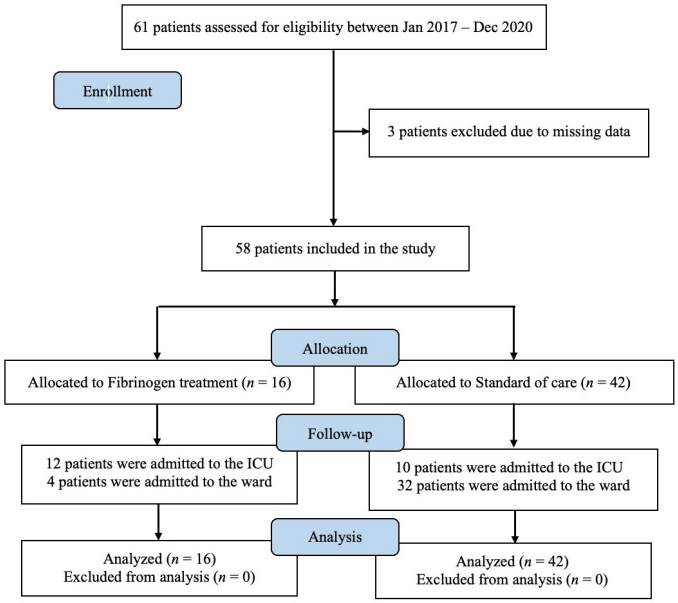

Figure 1. Flowchart of the study. ICU: intensive care unit.

Anesthesia Management

In the risk assessment of AIP cases in our hospital, in the preoperative ultrasonography (USG) examination, a preliminary diagnosis is made with USG findings such as the absence of the typical retroplacental hypoechoic region and thinning of the hyperechoic area between the uterus serosa and the bladder. Definitive diagnosis and determination of the depth of invasion are made by intraoperative observation and histopathological examination of the uterus.

Electrocardiography (ECG), peripheral oxygen saturation ($Sp0_2$), and non-invasive blood pressure are routinely monitored in our patients who were operated on with a prediagnosis of AIP.

As a method of anesthesia, while regional anesthesia can be applied in consultation with the surgical team in selected cases with uncomplicated minimally invasive placentation, general anesthesia is preferred in most cases.

According to the protocol in cesarean section operations in our clinic, anesthesia induction is supplied with intravenous (IV) propofol and rocuronium for general anesthesia if the patient's hemodynamics is stable. In the maintenance of anesthesia, sevoflurane is used until the delivery, and fentanyl is administered for analgesia after the delivery.

In patients with expected perioperative bleeding such as placental invasion anomaly, abruption, and uterine atony; wide vascular accesses (14-16 gauge) are provided, radial artery cannulation is provided after the Allen test, invasive blood pressure monitoring and blood gas analyzes are followed for close perioperative hemodynamic monitoring. In addition, an intraoperative USG-guided 7F central jugular catheter is inserted in patients with excessive bleeding, impaired hemodynamics, and needing a massive blood transfusion.

Hemodynamically unstable patients need inotropes/vasopressors, undergo massive transfusion, and are admitted to the postoperative intensive care unit for whom close hemodynamic follow-up was decided. Patients with stable postoperative hemodynamics are extubated, taken to the recovery room, and followed up there. Patients with stable vitals and a Modified Aldrete score >8 are sent to the service. For elective cases diagnosed with placental invasion anomaly, 5-6 units of Red Blood Cell (RBC) and 5-6 unites of fresh frozen plasma (FFP) are prepared in our blood center, and fibrinogen concentrate is requested.

Since the laboratory fibrinogen level was not requested from the preoperative patients or because the surgeries were emergent; in the gynecology and obstetrics clinic and anesthesiology and reanimation clinic, 2 gr of fibrinogen concentration was given to the patients with Hb <10 mg/dL, perioperative ≥2000ml bleeding, unstable hemodynamics despite adequate blood product replacement, and suspected bleeding diathesis.

In cases of cesarean section performed under regional anesthesia in our clinic, after adequate asepsis/antisepsis is provided in the sitting position; bupivacaine + fentanyl, which is calculated according to the patient's height (average 10 mg bupivacaine + 10 mcg fentanyl), was applied by a 25G spinal needle through the L3-L4 intrathecal space. It was possible to use general anesthesia for patients who develop intraoperative PPH and whose hemodynamics are impaired.

Variables

The data in our study were obtained from the patient file, our hospital's electronic information center, and anesthesia observation files. In addition, demographic data of patients (age, ASA score), diagnosis, duration of operation, perioperative laboratory findings, anesthesia type, perioperative hemodynamics (highest heart rate, lowest mean arterial pressure (MAP)), shock index), amount of bleeding, blood products and fluids used, surgical interventions (B-Lynch, Bacri balloon application, uterine artery ligation, hysterectomy), intraoperative vasopressor/inotrope use, ICU stay, laboratory results in the first 24 hours postoperatively, and total hospital stay were recorded.

The patients were divided into two groups fibrinogen administered and non-administered. In addition, the patients who were hospitalized in the postoperative intensive care unit and those who were not hospitalized were also evaluated.

Statistical analysis

Statistical analysis was performed using Statistical Package of Social Sciences version 21 (IBM SPSS Statistics; IBM Corp., Armonk, NY). Categorical measurements were presented as numbers and percentages, and numerical measurements were presented as mean and standard deviation. Student t-tests were used for data with normal distribution, Mann Whitney-U test with non-normal distribution, and chi-square test for categorical data.

Results

During the study period, 61 patients were identified from the scanned files. Three patients were excluded due to the missing data. The mean age of 58 patients included in the study was 33.6 ± 5.0 years; 81% of the patients were evaluated as emergent. General anesthesia was administered to 36 (62.1%) patients, and in 4 emergency cases that started with spinal anesthesia was switched the general anesthesia due to bleeding and unstable hemodynamics. The mean operation time was founded as 146.3 ± 32.9 minutes. In the preoperative evaluation, 27 (46.5%) patients were diagnosed with placenta accreta, and placenta previa was diagnosed in 19 (32.7%) patients.

Table 1. Demographic and clinical chraacteristics of the patients (n=61).

Variable		Value ‡	Value §
Age (year)			33.6 ± 5
ASA grade	2	3 (91.4)	
	3	5 (8.6)	
Gravide			3.44±1.19
Parite			2.20±1.11
Gestational week			35.22±2.34
Cesarean section	0	3(5.1)	
	1	21 (36.2)	
	2	21 (36.2)	
	3	10 (17.2)	
	4	3 (5.1)	
Neonate	First min. APGAR score		6.10±1.9
	Fifth min. APGAR score		7.58±1.92
Diagnosis	Acreata	27 (46.5)	
	Perkreata	12 (20.6)	
	Previa	19 (32.7)	
Preoperative hemoglobin (g /dL)			11.1 ± 1.4
Preoperative platelet ($\times 10^4/\mu L$)			218.9 ± 61.4

§: mean ± standard deviation, ‡: n (%).
ASA: American Society of Anesthesiologists

Demographic data and preoperative characteristics of the patients are shown in Table 1. Intraoperative and postoperative findings of the patients are shown in Table 2. Total hysterectomy was performed in 32 (55.2%) cases, and partial resection was performed in two (3.4%) of them. On the other hand, three (5.2%) patients did not receive any additional surgical treatment. Besides medical measures to stop bleeding and approach for compression, only a cesarean section was performed. Fibrinogen concentrate was used in 25 (43.1%) patients. Noradrenaline infusion was started in 16 (27.6%) patients whose hemodynamics did not improve despite intraoperative fluid replacement and whose MAP was <60 mmHg. Forty units of oxytocin and 1 g of tranexamic acid were administered as an infusion to all patients. 25 (43.1%) patients were hospitalized in the postoperative ICU. No mortality was observed in the patients included in the study.

In patients given intraoperative fibrinogen concentrate, the intraoperative shock index was 1.5±0.2 (0.9-1.8), the amount of intraoperative bleeding was 2575±302.2 ml, and the fibrinogen levels measured in the first 24 hours after surgery were 294.7±79.7 mg/dl. In addition, it was shown that the shock index was higher ($p<0.001$), the amount of bleeding was higher ($p<0.001$), and the amount of RBC and FFP used was significantly higher ($p<0.001$) in patients who used fibrinogen concentrate compared to patients who did not use it (Table 3).

In patients with postoperative ICU hospitalization, the SI was 1.3±0.3 (0.6-1.8), and 14 (58.3%) of the patients were given vasopressor (noradrenaline) support. The duration of hospital stay was determined as 7.1±5.7 days, and intraoperative mean 4.3±1.7 (1-8) units of RBC was used (Table 4).

Table 2. Intraoperative findings of the study group.

		Mean±SD	n (%)
Anesthesia	General		36 (62.1)
	Spinal		22 (37.9)
Duration of operation (min)		146.3 ± 32.9	
Intraoperative crystalloid (mL)		2439.6 ± 593.2	
Intraoperative colloid (mL)		698.2 ± 246.7	
Intraoperative RBC Units		3.08 ± 1.7	43 (72.8)
İntraoperative massive transfusion			12 (20.3)
Postoperative RBC Units		0.8 ± 1.3	21 (35.5)
Intraoperative FFP Units		3±1.6	43 (72.8)
Intraoperative lowest Hb value in arterial blood (g/dL)		8.2± 1.9	
Intraoperative fibrinogen concentrate 2 gr			25 (43.1)
Shock index		1.01± 0.4	
Intraoperative highest lactate level in arterial blood (mmol/L)		2.1± 1.6	
Intraoperative highest BE levels in blood gas mEq/L		-5.2 ± 4.1	
Postoperative Hb (g/dL)		9.6 ± 0.8	
Postoperative platelet ($\times 10^4/\mu L$)		171.4 ± 60.1	
Surgery type	Hysterectomy		32 (55.2)
	Bilateral hypogastric + uterine artery ligation		7 (12.1)
	B-lynch suture + Bacri balloon + bilateral hypogastric artery ligation		9 (15.5)
	Bakri ballooon + uterin artery ligation		5 (8.6)
	Partial resection		2 (3.4)
	Only cesarean		3 (5.2)
Intraoperative vasopressor (noradrenalin) support			16 (27.6)
Postoperative Hb (g/dL)		9.6 ± 0.8	
Postoperative RBC Units		0.8 ± 1.3	
Postoperative FFP Units		0.6 ± 1.1	
Postoperative ICU stay			25 (43.1)
Total hospital stay (day)		5.6 ± 4.3	

RBC: Red blood cell, FFP: fresh frozen plasma, ICU: intensive care unit, Hb: Hemoglobin.

Table 3. Comparison of the intraoperative findings of the patients with and without fibrinogen application.

		Patients with fibrinogen (n=16)	Patients without fibrinogen (n=42)	p
Duration of operation (min) §		137.1±29.7	149.8±33.7	0.192
Shock index †		1.5±0.2 (0.9-1.8)	0.8±0.3 (0.5-1.6)	<0.001
Intraoperative bleeding (mL) §		2575±302.2	1582.1±392.4	<0.001
Intraoperative RBC units		5.0±1.3 (3-8)	2.3±1.1 (1-6)	<0.001
Postoperative RBC units †		1.8±1.7 (0-5)	0.6±1.0 (0-4)	0.005
Intraoperative FFP units †		4.7±1.2 (2-7)	2.3±1.1 (1-6)	<0.001
Postoperative FFP units †		1.0±1.4 (0-4)	0.5±1.1 (0-4	0.149
Intraoperative crystalloid (mL) §		2906.2±685.5	2261.9±447.1	<0.001
Diagnosis ‡	Acreata	7 (43.8%)	20 (47.6%)	0.882
	Perkreata	4 (25%)	8 (19%)	
	Previa	5 (31.2%)	14 (33.3%)	
Preoperative hemoglobin (g/dL) §		9.4±0.6	11.6±1.2	<0.001
Postoperative hemoglobin (g/dL) §		9.5±0.9	9.6±0.8	0.592
Intraoperative lowest Hb value in arterial blood (g/dL) §		6.7±1.5	8.8±1.7	<0.001
Intraoperative highest lactate in arterial blood (mmol/L) §		3.8±2.0	1.5±0.8	<0.001
Postoperative fibrinogen (mg/dL) §		294.7±79.7	299.9±83.8	0.972
İntraoperative vasopressor (noradrenalin) support ‡		8 (50%)	7 (16.7%)	0.010
Postoperative ICU stay ‡		12 (75%)	10 (23.8%)	<0.001
Total hospital stay (day) †		7.6±6.6 (3-31)	4.9±2.8 (2-17)	0.025

§: mean ± standard deviation, ‡: n (%), †: mean ± standard deviation (min-max).
RBC: Red blood cell, FFP: fresh frozen plasma, ICU: intensive care unit, Hb: Hemoglobin.

Discussion

In this retrospective study, we aimed to evaluate the anesthesia management and postoperative outcomes of patients with placental invasion anomaly and intraoperative bleeding.

We observed that a large amount of bleeding occurs in patients with AIP and that intraoperative blood products are needed. In addition, regardless of fibrinogen level, it was observed that patients with bleeding more than 2000 ml had almost the same postoperative fibrinogen levels compared to patients with less bleeding, with the use of fibrinogen concentrate, and postoperative ICU requirement was observed in patients who developed PPH.

Postpartum hemorrhage is frequently seen in maternal deaths and is a life-threatening phenomenon. In many studies, the anesthesiologist's approach, blood product transfusion, management, choice of ideal anesthetic manner, and postoperative care in life-threatening major bleeding cases have been examined [12, 13]. In these studies, no superiority over the other has been stated, and inferences can be made at the recommendation level. This retrospective study found that patients with placental invasion anomalies and who underwent major obstetric surgery due to postpartum hemorrhage had high shock indexes, high lactate levels, and increased bleeding. Therefore, hysterectomy was performed in 32 (55.2%) of the patients included in our study, and methods such as bilateral hypogastric artery + uterine artery

Table 4. Comparison of the intraoperative findings of the patients with and without ICU stay.

		Patients without ICU stay (n=36)	Patients with ICU stay (n=22)	p
Duration of operation (min) §		141.1±32.7	155±32.1	0.120
Shock index †		0.7±0.2 (0.5-1.5)	1.3±0.3 (0.6-1.8)	<0.001
Intraoperative bleeding (mL) §		1609.7±441.2	2259.0±557.7	<0.001
Relaparotomy ‡	None	30 (83,3%)	16 (72,7%)	0.175
	Bleeding	6 (16,6%)	4 (18,1%)	
	Infection	0 (0)	2 (9,0%)	
Intraoperative RBC units		2.3±1.0 (1-6)	4.3±1.7(1-8)	<0.001
Postoperative RBC units †		0.6±1.0 (0-3)	1.5±1.6(0-5)	0.022
Intraoperative FFP units †		2.2±1.1(1-6)	4.1±1.5 (1-7)	<0.001
Postoperative FFP units †		0.4±0.9 (0-4)	1.1±1.4 (0-4)	0.011
Intraoperative crystalloid (mL) §		2208.3±472.9	2818.1±583.6	<0.001
Diagnosis ‡	Acreata	16 (44,4%)	11 (50%)	0.901
	Perkreata	8 (22,2%)	4 (18,1%)	
	Previa	12 (33,3%)	7 (31,8%)	
Preoperative hemoglobin (g/dL) §		11.6±1.3	10.0±1.1	<0.001
Postoperative hemoglobin (g/dL) §		9.7±0.8	9.5±.8	0.381
Intraoperative lowest Hb value in arterial blood (g/dL) §		8.9±1.6	7.1±1.8	<0.001
Intraoperative highest lactate in arterial blood (mmol/L) §		1.3±0.5	3.5±1.8	<0.001
Postoperative fibrinogen (mg/dL) §		303.3±73.8	290.5±95.4	0.202
Intraoperative vasopressor (noradrenalin) support ‡		1 (2,7%)	14 (63,6%)	<0.01
Postoperative ICU stay ‡		4 (11,1%)	12 (54,5%)	0.001
Total hospital stay (day) †		4.7±2.9	7.1±5.7	0.003

§: mean ± standard deviation, ‡: n (%), †: mean ± standard deviation (min-max).
RBC: Red blood cell, FFP: fresh frozen plasma, ICU: intensive care unit, Hb: Hemoglobin.

ligation, B-Lynch suture + Bacri balloon application were applied as uterus-sparing surgery.

In the retrospective study of Binici et al. [14], it was observed that blood loss was generally lower in patients with placental anomaly who underwent neuraxial anesthesia, the average amount of blood product used was lower than those in whom general anesthesia was administered, and the requirement of intensive care hospitalization in the postoperative period was lower in patients with neuraxial anesthesia. In our study, general anesthesia was applied to 36 (62.1%) patients, and 4 of 22 patients whose surgery started with spinal anesthesia were switched to general anesthesia due to bleeding and unstable hemodynamics.

In their retrospective study, Seyhan et al. [15] stated that general anesthesia may be a better option than neuraxial to ensure patient comfort and operational conditions in patients with significant bleeding.

While Kalelioglu et al. [16] study, that was presented 85 PPH cases who underwent hysterectomy and reported that 72 (84.7%) of the patients received intraoperative blood product transfusion, on the other hand, in our study, a 1:1 ratio of RBC: FFP transfusion was used in 43 (72.8%) patients intraoperatively. In the presented study, 12 (20.3%) patients were transfused with 3.08 ± 1.7 units of RBC and were given >4 units of RBC. Intraoperative 4.3±1.7(1-8) units of RBC were used in the patients hospitalized in ICU postoperatively, and no complications related to transfusion were observed.

In their retrospective study, Okada et al. [17] investigated the relationship between lactate, fibrinogen levels, and shock index (SI) with massive transfusion requirements in case of postpartum hemorrhage. This study reported that SI was helpful in the early diagnosis of shock due to its ease and speed of application. Still since SI could not give an idea about the hemodynamic status in these cases, its relationship with massive transfusion requirements could not be examined. It has been shown that the follow-up of fibrinogen and lactate levels can give an idea about the massive transfusion requirement. It has been stated that lactate levels help predict massive transfusion requirements in case of postpartum hemorrhage. The precursors of impaired hemodynamics are the increased lactate level and shock index due to anaerobic metabolism caused by decreased tissue perfusion. The patients' lactate and shock index levels were found to be high in the presented study. Especially, lactate levels were 3.5±1.8 mmol/L (p<0.001), and the shock index was 1.3±0.3 (0.6-1.8) (p<0.001) in the patients who were hospitalized in the intensive care unit, were higher. The amount of blood product used was higher than those not hospitalized in the ICU (p<0.001), and which was also that was found to be compatible with the literature.

In their study, Sahin et al. [18] investigated the use of fibrinogen concentrates in obstetric hemorrhages. As a result of this study, it was observed that the use of appropriate fibrinogen reduces unnecessary blood product use, thus reducing the risk of volume overload and related complications. However, the study found no significant relationship between fibrinogen use and length of hospital and intensive care unit stay. In our study, fibrinogen concentrate was used in 25 (43.1%) patients, and the intraoperative bleeding amount of these patients was 2575±302.2 ml, and 5±1.36 units of RBC were used, and postoperative Hb values were 9.53±0.94 g/dL. Patients, who applied fibrinogen concentrate, were those with more intraoperative bleeding (p<0.001), more unstable hemodynamics, and higher SI (p<0.001). Despite this, postoperative Hb values of the patients differed from the group that was not applied fibrinogen. The postoperative fibrinogen levels of 294.7±79.7 mg/dl also suggest that it may help to maintain the fibrinogen level within normal limits despite excessive bleeding. In the study of Butwick et al. [19], practical use of fibrinogen concentrate, especially in cases with an expectation of 1000-1500 mL of total blood loss, can be evaluated for postpartum hemorrhage management; however, they stated that this use might be more reliable after the determination of fibrinogen levels. In our study, fibrinogen concentrate was used in patients with bleeding of 2000 ml or more, and although preoperative and intraoperative fibrinogen levels could not be measured, it was found within the postoperative normal limits. For obstetric authorities, it is acceptable that the fibrinogen level falls below 200 in such a level of bleeding.

In the literature, 50% of patients who underwent emergent surgery due to placental anomaly, required ICU in the postoperative period; on the other hand, 14.8% of patients operated under elective conditions required ICU [20]. In our study, 25 (43.1%) patients were admitted to the ICU. In addition, patients who have been operated on for abnormal placental invasion also need more supportive drug therapy [21]. In this study, in patients who were transferred to the ICU, the lowest Hb levels were found to be 7.3±1.8g/dL and the highest intraoperative

lactate level was found to be 3.5±1.8 mmol/L in intraoperative blood gas; and 14 (58.3%) patients were transferred to the ICU for close hemodynamic follow-up due to the increase in crystalloid and colloid fluid consumption, in need of intraoperative vasopressor support and intraoperative blood product.

We think that in our hospital, for the patients with placental insertion anomaly; the reasons such as good preoperative follow-up, the multidisciplinary approach of the surgical team and the anesthesia team, applying according to a specific PPH protocol, and the preoperative preparation of adequate blood products were helped us in obtaining our results. Therefore, we think that the results of our study will be helpful for meta-analyses.

The limitations of our study were its retrospective design, the inability to measure the preoperative fibrinogen level, and the low number of patients. We think that prospective studies with a more significant of patients and using devices such as noninvasive hemodynamic monitoring, thromboelastogram, or ROTEM to close following up of coagulation will make new contributions to the literature.

In conclusion, anesthesia management of patients diagnosed with abnormal placental invasion is important because of major hemorrhage. For these patients, preoperative blood product preparation with a multidisciplinary approach and a postoperative ICU plan should be made due to unstable hemodynamics.

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Influence of weekly endoscopic debridement on success rate of endoscopic transcanalicular diode laser dacryocystorhinostomy

Haftalık endoskopik debridmanın endoskopik transkanaliküler diod lazer dakriyosistorinostominin başarı oranı üzerine etkisi

Cevat Uçar[1], Selim Genç[2]

Abstract

Aim: To evaluate the outcomes of transcanalicular diode laser DCR (TL-DCR) in patients with chronic dacryostenosis.

Methods: In this retrospective study we included 75 eyes of 67 patients with chronic dacryostenosis who underwent TL-DCR. In 65 patients transnasal endoscopic debridement the opening and nasalacrimal syringing was performed every week for 1 month (Group 1, 65 patients). The later patients who did not have postoperative visits were defined as Group 2 (10 patients). All patients were examined at postoperative 3 months.

Results: In group 1, 65 of 63 patients had complete surgical success and two had restenosis. In group 2, six of 10 patients had success however four had restenosis. In group 1 the surgical success rate was 98% whereas it was 60% in group 2 ($p< 0.001$). None of the patients had any serious complications including infection and bleeding.

Conclusions: The surgical success rate of TL-DCR may increase by endoscopic debridement after the surgery.

Keywords: Dacryocystorhinostomy, chronic dacryostenosis, transcanalicular diode laser

Öz

Amaç: Kronik dakriyostenozlu hastalarda endoskopik transkanaliküler diod lazer ile dakriyosistorinostomi sonuçlarını değerlendirmek.

Yöntemler: Bu retrospektif çalışmaya 67 kronik dakriyostenozlu hastanın transkanaliküler lazer ile dakriyosistorinostomi yapılan 75 gözü dahil edildi. Ameliyat sonrası 65 hastaya nazolakrimal kanal açma ve yıkama için 1 ay boyunca her hafta transnazal endoskopik debridman yapıldı (Grup 1, 65 hasta). Postoperatif bakım yapılmayan hastalar Grup 2 (10 hasta) olarak tanımlandılar. Tüm hastalar en son 3. ayda muayene edildiler.

Bulgular: 1. grupta 65 hastanın 63'ünde tam cerrahi başarı sağlandı, iki hastada restenoz gelişti. 2. grupta 10 hastanın altısında başarı sağlandı, ancak dört hastada restenoz gelişti. 1. Grupta cerrahi başarı oranı %98, 2. grupta ise % 60 idi ($p< 0,001$). Hastaların hiçbirinde ciddi bir komplikasyon, enfeksiyon ve kanama görülmedi.

Sonuç: Ameliyat sonrası transnazal endoskopik debridman yapılması transkanaliküler lazer ile dakriyosistorinostominin başarı oranını arttırabilir.

Anahtar Kelimeler: Dakriyosistorinostomi, kronik dakriyostenoz, transkanaliküler diod lazer.

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Introduction

The main surgical method for the management of nasolacrimal duct obstruction with epiphora is external dacryocystorhinostomy (DCR). In DCR, nasolacrimal sac and the nasal cavity is communicated directly by creating a fistula. The first DCR surgery is presented by Toti et al. [1] in 1904. The surgery was than improved by Dupuy-Dutemps and Bourguet [2] by suturing the nasal and lacrimal mucosa achieving a success rate over 90%. In recent years minimal invasive surgical options have gained popularity due to minimal collateral damage and faster recovery times. These surgical methods include endoscopic endonasal laser and endoscopic transcanalicular laser DCR.

Compared to external DCR, endoscopic DCR has the advantages including the absence of external scar, decreased surgical time, less intraoperative bleeding and more protected lacrimal pump function [3, 4].

The first application of laser was first introduced by Massaro et al. [5] in 1990 using a blue-green light Argon laser in cadavers, than the clinically application was performed by Reifler in 1993 [6]. In 2000, Eloy et al. [7] introduced endoscopic transnasal, transcanalicular diode laser surgery.

In the current study we aimed to report outcomes of endoscopic transcanalicular diode laser DCR (TL-DCR) in patients with chronic dacryostenosis.

Material and methods

In this retrospective study we included 75 eyes of 67 patients with chronic dacryostenosis who underwent TL-DCR between 2010 and 2020 years. The age of patients was between 55-70 years (mean 61 years). All patients having chronic dacryocystitis with obstruction distal to common canaliculus were included in the study. Exclusion criteria were patients younger than included patients younger than 4 years, lacrimal stenosis prior to the common canaliculus, and patients with nasal pathologies like deviated nasal septum.

All patients had preoperative full ophthalmic examination, lacrimal syringing and probing and diagnostic nasal endoscopy.

All surgeries were performed under local anesthesia. Instrument details are 980 nm diode laser (BioLitec; Cream Optec, GmbH, Germany) with 600-µm laser fiber and 0º rigid nasal endoscope. A 0.5-mm metal stent with guiding wire was introduced through the upper puncta via the canaliculus to reach the medial wall of lacrimal sac until a hard stop was felt. A laser probe was introduced through the stent up to the medial wall of the sac. The infrared target light at the probe end was visualized endoscopically at the lateral wall of the nose. Once ideally positioned in the anteroinferior part of the middle meatus, laser delivery was started in a pulse method. The power setting ranged from 3 to 10 W. Lacrimal sac mucosa, bone, and nasal mucosa were vaporized to create a fistula. The opening was then enlarged by burning the edge in a circular fashion to create a final opening of a minimum of 5 mm diameter (Figure).

In 65 patients transnasal endoscopic debridement the opening and nasalacrimal syringing was performed every week for 1 month (Group 1, 65 patients). The later patients who did not have postoperative visits were defined as Group 2 (10 patients). All patients were examined at postoperative 3 months. In patients with restenosis, TL DCR was reperfromed. Bicanalicular silicon tube intubation was also performed and was left in position for 3 months.

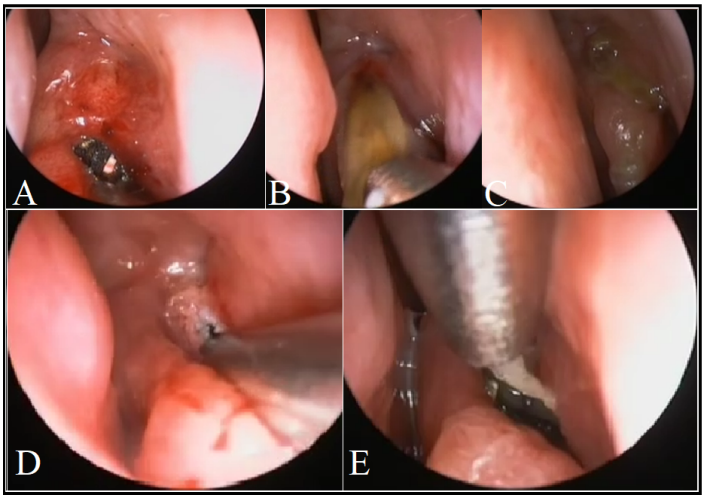

Figure. The opening of the ostium through the nasal cavity intraoperatively (A); posoperative 1 week (B); 2 weeks (C); 3 weeks (D); 4 weeks (E).

Statistical analysis

For descriptive statistics, mean ± standard deviation was used to give continuous data with normal distribution. Median with minimum-maximum values was applied for continuous variables without normal distribution. Numbers and percentages were used for categorical variables.

The Mann-Whitney U test compared two independent groups where numerical variables had no normal distribution.

The significance level (p-value) was determined at 0.05 in all statistical analyses.

Statistical analyses were performed using SPSS Statistics 17.0 (Statistical Package for Social Sciences for Windows, version 17.0, SPSS Inc., Chicago, U.S., 2008) software package.

Results

In group 1, 65 of 63 patients had complete surgical success and 2 had restenosis. In group 2, six of 10 patients had success; however, four had restenosis. These patients underwent additional TL-DCR and Bicanalicular sialistic intubation. Among these patients 1 had restenosis and this patient was managed with external DCR and complete success was achieved.

None of the patients had any serious complications including infection and bleeding.

The total success rate of TL-DCR was 98%. All the patients had routine day activities after 24 hours. The silicon tubes were removed after 3 months in all patients. At postoperative 1 month all the DCR ostiums were completely opened.

In group 1 the surgical success rate was 98% whereas it was 60% in group 2. The difference between groups was statistically significant ($p< 0.001$).

Discussion

Chronic dacryocystitis is chronic inflammation of lacrimal sac and the main reason is obstruction of nasolacrimal duct. In the absence of treatment cases chronic dacryocystitis may lead to recurrent conjunctival inflammation, dacryocoele, lacrimal sac fistula and orbital cellulitis. External DCR is still accepted as the gold standard option for the management of chronic dacryocystitis. DCR achieves favorable anatomical and functional outcomes however it includes some disadvantages such as

cutaneous scar, prolonged procedure time and per operative bleeding.

Transcanalicular laser assisted DCR is a minimally invasive surgical method compared to external DCR.8 The main advantages are the absence of external skin incision and quick postoperative recovery. This surgery also includes the advantages of short learning curve, less surgery time and minimal per-operative bleeding [9, 10].

The success rates of DCR shows differences based on the surgical technique and the surgeon. A variety of studies reported the success rate of external DCR 77% and 100% [11]. In a study Plaza et al. [12] showed a success rate of 88% in TL-DCR. Ajalloueyan et al. [13] reported very similar success rates for external DCR and TL-DCR in a study including 244 patients totally. The success rate was 92% for external DCR and 93% for TL-DCR in their study.

Recently Ozturker et al. [14] compared the outcomes of TL-DCR, endonasal DCR and external DCR. The success rates in their study were 65%, 70% and 84%, respectively. In our study, the success rate for TL-DCR was significantly increased compared to those previously reported. There are some possible explanations for the increased surgical success rate in our study. First is the medicalization of the medium chonca during the operation. Second we have performed our surgery by the assistance of endonasal view which allows the direction of laser probe through the canaliculus correctly and avoid damaging the canaliculus and surrounding tissues. In addition the debridement of ostium wound for every week postoperatively.

The major limitation of this study was the short follow-up period time. Another limitation is the small size of control group. Hence, future study needs to be performed with long-term follow-up and a larger population.

In conclusion, endoscopic debridement after the surgery seems to improve the surgical success rate of TL-DCR. However, our findings should be evaluated in future studies.

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