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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?

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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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