Int J Clin Exp Med 2016;9(7):14656-14662
www.ijcem.com /ISSN:1940-5901/IJCEM0024120

Original Article

Predictive factors affecting mortality in relaparotomies

Ömer BAŞOL[1], Hüseyin Pülat[2], İsmail Zihni[3], Sedat Damar[1], Kazım Çağlar Özçelik[3], Hüseyin Eken[4], Oktay Karaköse[5], Alpaslan Fedai Çalta[6], Ali Duran[7], Zülfü Arikanoğlu[1]

[1]Department of General Surgery, Dicle University, Turkey; [2]Department of Surgical Oncology, Mersin State Hospital, Turkey; [3]Department og Surgical Oncology, Suleyman Demirel University, Turkey; [4]Department of General Surgery, Erzincan University, Turkey; [5]Department of Surgical Oncology, Samsun Training Research Hospital, Turkey; [6]Department of General Surgery, Bandırma State Hospital, Turkey; [7]Department of Surgical Oncology, Cukurova University, Turkey

Received January 15, 2016; Accepted May 4, 2016; Epub July 15, 2016; Published July 30, 2016

Abstract: Aim: The present study was aimed to analyze the predictive factors for the mortality of relaparatomies. Materials and method: The retrospective study included 236 patients who underwent abdominal surgery and at least one subsequent relaparatomy at Dicle University School of Medicine Department of General Surgery between January 2000 and December 2011. The evaluations included age, gender, accompanying systemic diseases, procedure used in the primary surgery and its condition (emergency/elective), total amount of blood transfusion since the primary surgery, length of time between the primary surgery and relaparatomy, date of the primary surgery, preoperative parameters (albumin, platelet, hemoglobin, leukocyte, and MPV), Glasgow coma score, length of hospital stay, length of stay in intensive care unit, and presence of shock. Results: The patients comprised 165 (69.9%) men and 71 (30.1%) women. The mean age was 55.5±17.22 years (15-89). Early stage relaparatomy (i.e. within the 21 days following the primary surgery) was performed in 231 (97.8%) patients while 5 (2.2%) patients received it in the late stage (i.e. after the 21st day). Mortality rate was 13.8% (32/231) in the early stage and 80.0% (4/5) in the late stage. The patients over 50 years old had a mortality rate of 66.6% (24/36) and the ones below 50 years old had 6.0% (12/200). It can be concluded that the need for a relaparatomy and the risk of mortality could be reduced by a well-arranged primary surgery and efficient time management in handling the postoperative complications. Nevertheless, if needed, relaparatomy could be life-saving when performed at the correct time. Conclusion: The decision whether and when to perform a relaparatomy, preoperative preparation, number of laparatomies, amount of blood transfusion, and the length of period since the primary surgery are important factors for the mortality.

Keywords: Relaparatomy, mortality

Introduction

Relaparotomy can sometimes be required as a result of various complications following intra-abdominal operations. Relaparotomies continue to be a problem in general surgery clinics since they carry high morbidity and mortality risk despite developments in surgical techniques, anesthesia, intensive care monitoring, antibiotherapy, and medical technology. As a result of this, it is very difficult to determine when a relaparotomy should be performed.

It is life-saving to re-operate on patients observed with postoperative complications in the early period. Relaparotomy used to be conducted to a less degree since doctors concentrated on conservative treatment, and often hesitated to make the decision for a second surgery. The rate of laparotomy has been increasing thus far due to changes in this conservative treatment.

Relaparotomies are classified as urgent/elective, early/late, palliative/radical, and planned/unplanned. The most common causes requiring early relaparotomy are peritonitis, evisceration, and bleeding [1]. The most common cause requiring late relaparotomy is intestinal obstruction due to adhesion [2]. Abdominal evisceration remains a serious complication of surgeons dealing with abdominal surgery despite developments in preoperative and postoperative care, surgical materials, and techniques. Recognizing complications of postoperative peritonitis that developed early after intra-abdominal surgery and performing relaparotomy in order to immediately eliminate any pathogens can be lifesaving. Adhesions causing late relaparotomies are still critical today.

The aim of relaparotomy is to do a peritoneal lavage in order to drain abscesses and fluid collections, debride necrotic tissues, and reduce the amount of microorganisms. Relaparotomy is performed in 20%-40% of patients with severe peritonitis in the abdominal cavity [3]. Reoperation may be required at various times following laparotomies.

The aim of this clinical study was to investigate the reasons for relaparotomies by retrospectively evaluating patients underwent intra-abdominal surgery.

Material and method

This descriptive study was conducted by retrospectively evaluating file records of 236 patients undergoing abdominal surgery and relaparotomy between January 2000 and December 2011 in the General Surgery Clinic in Dicle University Medical Faculty Hospital. Certain characteristics of patients, type of surgical procedure, length of hospital stay and performed procedures, and some blood indices were obtained and examined from the file records of patients.

The operations associated with the first operation within the first 60 days following the first operation were taken into consideration and considered to be relaparotomies. The relaparotomies performed within the first 21 days were classified as early, while the relaparotomies performed after the 21st day were classified as late.

Independent risk factors associated with and affecting mortality were statistically analyzed by examining complications causing relaparotomy and mortality. APACHE II score was calculated as the risk factor in this study.

SPSS 15.0 statistical software package was used for statistical analysis. The descriptive statistics of continuous variables were presented using mean and standard deviation (SD) values. Discrete variables were converted into cross-tables and analyzed using Chi-Square with Yates correction. The normality of data was tested by Kolmogorov - Smirnov test. The mean values of variables were analyzed using Student's t test. Hypotheses were bi-directional and $P < 0.05$ was considered to be a statistically significant result.

Findings

69.9% (165) of 236 patients included in the study were males. The mean age was 55.5± 17.22 (15-89) years. The mean duration of hospital stay was 25.82±19.86 (1-90) days. The mean duration between first operation and relaparotomy was 7.17±6.97 (0-60) days. 97.8% (231 individuals) of 236 patients received relaparotomy in the early period. Systemic disease presented in 53.8% (127/236) of patients. The most common systemic disease was hypertension, which was observed in 20.4% (26/127). The most common mortality cause was CAD with a ratio of 18.8% (24/127) in patients with systemic disease, and its mortality rate was 29.1% (7/24).

The mean mortality rate was 15.25% (36/236) in patients undergoing relaparotomy. The most common cause of mortality was sepsis and multiple organ failure with a ratio of 69.4% (25/36). On the other hand, other causes of mortality were cardiac diseases and lung diseases with a ratio of 13.8% (5/36); as well as coagulopathy and hypovolemic shock with a ratio of 16.8% (6/36).

The mortality rate was 13.8% (32/231) in patients undergoing relaparotomy in the early period, while it was 80.0% (4/5) in patients undergoing relaparotomy in the late period. It was 66.6% (24/36) in patients over the age of 50 years, and 6.0% (12/200) in patients under the age of 50 years.

Relaparotomy was performed most commonly following GIS operations with a ratio of 46.6% (110/236); it was followed by multiple organ trauma with a ratio of 16.9% (40/236), vascular injuries with a ratio of 14.4% (34/236), and hepatobiliary system pathologies with a ratio of 11.4% (27/236). The mortality rate was 16.3% (18/110) in those undergoing relaparotomy after GIS operations, 15.0% (6/40) in those undergoing relaparotomy after multiple organ trauma, and 18.5% (5/27) in those undergoing relaparotomy after hepatobiliary system pathologies.

The most common cause of relaparotomy was hemorrhage with a ratio of 32.2% (76/236). The other causes were GIS fistula with a ratio of 21.2% (50/236), intestinal necrosis with a ratio of 10.6% (25/236), peritonitis with a ratio of

Table 1. Univariate analysis of factors affecting mortality in patients undergoing relaparotomy

	Mortality			
	Present	Absent		
	Mean ± Std deviation	Mean ± Std deviation	t	p
Mpv	7.11±1.63	7.83±1.92	3.120	< 0.001
Relaparotomy duration	3.04±1.85	4.98±1.99	3.260	< 0.001
APACHE II	10.33±2.61	26.06±6.81	24.34	< 0.001
Age	47.22±20.30	50.05±20.45	2.251	< 0.025
Preoperative albumin	2.47±0.70	2.38±0.69	0.715	< 0.475
Preoperative leucocyte	13.13±8.95	14.66±5.32	0.996	< 0.320
Duration of Hospital Stay	16.38±16.39	11.14±5.70	1.892	< 0.814
Duration of ICU Stay	7.17±5.50	6.97±4.43	0.204	< 0.198
Glasgow score	12.64±2.17	11.36±2.92	3.071	< 0.275
Preoperative hemoglobin	10.08±4.03	9.48±1.91	0.867	< 0.387
Preoperative Platelet	201.2±168.7	180.0±11.3	0.727	< 0.468

7.2% (17/236), and intra-abdominal abscess with a ratio of 6.3% (15/236). The most common cause of mortality among those was intra-abdominal abscess with a ratio of 26.6% (4/15) followed by MAT with a ratio of 24.0% (6/25).

The mortality rate was 10.8% (16/148) in patients undergoing operation under emergency conditions, and 22.7% (20/88) in patients undergoing operation under elective conditions. There was a malignancy in 20 (8.5%) patients undergoing relaparotomy. The mortality rate was 10% (2/20) in patients with malignancy. The mortality rate was 20.3% (26/128) in patients undergoing their first operation under night conditions, and 9.2% (10/108) in patients undergoing their first operation under day conditions.

Blood of 5.8±6.47 (0-32) units on average were transfused into 236 patients undergoing relaparotomy. The mortality rate was 22.4% (22/98) in 98 patients undergoing blood transfusion of more than 3 units, and 10.1% (14/138) in 138 patients undergoing blood transfusion of 0-3 units.

The mean APACHE II score was 26.06±6.81 (11-62) in 236 patients undergoing relaparotomy. APACHE II score was greater than 20 in 47 (19.9%) patients and less than 20 in 189 (80.1%) patients. The mortality rate was 63.8% (30/47) in patients with APACHE II score of greater than 20, while it was 36.2% (6/189) in patients with APACHE II score of less than 20.

All patients were given antibiotic prophylaxis before relaparotomy. Antibiotic therapy was found to be planned in 60.1% (142/236) of patients according to the results of the antibiogram culture.

The mortality rate was 19.7% (27/137) in patients undergoing relaparotomy a single time and 9.0% (9/99) in patients undergoing relaparotomy more than once. There was a state of hypovolemic shock in the preoperative period, and the mortality rate was 21.5% (33/153).

Mortality was found to be significantly related with presence of systemic disease, age being over 50 years, and APACHE II score of greater than 20. The univariate analysis of factors affecting mortality in patients undergoing relaparotomy is presented in **Table 1**.

According to values studied preoperatively; there was no significant relationship in terms of predictive factor affecting mortality in Albumin, Leukocytes, Platelet values, Glasgow coma score, length of stay in hospital, and intensive care unit (**Table 1**).

APACHE II score of greater than 20, high MPV value, presence of shock, first operation time, number of relaparotomy, blood transfusion, and duration of first operation were identified as independent risk factors affecting mortality as a result of univariate analyses on variables of advanced ages, presence of systemic disease, single relaparotomy, and APACHE II score of greater than 20 (**Table 2**).

Discussion

Relaparotomy is an occurrence of repetitive abdominal surgeries within the first 60 days following any abdominal surgical intervention, and is also related to the first intervention. The relaparotomies performed within the first 21 days following abdominal operations are classified as early relaparotomies, while those performed after 21st day are classified as late relaparotomies. The most common causes requiring early period relaparotomy are compli-

Table 2. The results of analyses of shock, first operation time, number of relaparotomy, number of blood transfusions, and duration of first operation according to selected discrete variables

	No Mortality	Mortality Presents	$X^2 \pm sd$	P
Shock			±12.6	< 0.001
Present	120 (60.0%)	33 (91.6%)		
Absent	80 (40.0%)	3 (8.4%)		
First operation time			±5.17	0.02
Emergency	132 (66.0%)	16 (44.4%)		
Elective	68 (34.0%)	20 (55.6%)		
Number of Relapse			±4.22	0.04
Single	110 (55.0%)	27 (75.0%)		
Multiple	90 (45.0%)	9 (25.0%)		
Blood transfusion			±5.79	0.01
> 3 unit	76 (38.0%)	22 (61.1%)		
≤ 3 unit	124 (62.0%)	14 (38.9%)		
Duration of first operation			±4.71	0.03
Day	102 (51.0%)	26 (72.2%)		
Night	98 (49.0%)	10 (27.8%)		
TOTAL	100 (100.0%)	36 (100.0%)	-	-

cations associated with a first operation such as peritonitis, evisceration, and bleeding; on the other hand, the most common cause of late relaparotomy is intestinal obstruction due to adhesion [1, 2, 4].

The incidence of relaparotomy has been indicated to be between 1%-7%, but is subject to change in type of disease, type of surgical intervention, surgical technique, and complications in literature; the early relaparotomy has been indicated to be 1.0%-4.4% [5, 6].

The most common cause of relaparotomy was hemorrhage with a ratio of 32.2% (76/236); while other causes were GIS fistula with a ratio of 21.2% (50/236), intestinal necrosis with a ratio of 10.6% (25/236), peritonitis with a ratio of 7.2% (17/236), and intra-abdominal abscess with a ratio of 6.3% (15/236) respectively in this study. Reviewing literature, there has been a widespread consensus that the most common cause of early relaparotomies is inflammatory complications, although various centers have been reporting various ratios [7-9]. Ünalp et al. reported in a study conducted, after a first abdominal surgery, in which the most common cause of relaparotomy was transfusion of intestinal contents into the abdominal cavity (intestinal repair and/or anastomotic leakage and intestinal perforation), furthermore other common causes were hemorrhage and intra-abdominal infection or abscess [4]. Harbrecht et al. reported intra-abdominal infections and anastomotic leakage as the most common causes of relaparotomy, respectively, in their study [10]. These complications require emergency abdominal relaparotomy and are life-threatening. Therefore, early diagnosis of complications and emergency relaparotomies are life-saving in many patients.

The cause of relaparotomy is one of the most important factors affecting mortality in emergency abdominal relaparotomies. We found in this study that the most mortal causes of relaparotomies are intra-abdominal abscess with a ratio of 26.6% (4/15), followed by MAT with a ratio of 24.0% (6/25). The most mortal causes were reported as anastomotic leakage and bleeding in a study of Kirk (96) conducted on abdominal and abdominothoracic operations; on the other hand, intestinal necrosis and GIS fistula were reported in the study of Ünalp et al. [4].

The incidence of intestinal necrosis was 10.6% (25/236) in this study. It was reported in the study of Uludağ et al. that the mortality rate was 13.6% in the group with necrosis, and 2.3% in the group without necrosis; furthermore the presence of necrosis was considered to be a significant factor affecting mortality [11]. Fevang et al. found the mortality rate to be 16% in the group with intestinal necrosis and 4% in the group without intestinal necrosis in patients operated on due to intestinal obstruction. They suggested that the presence of necrosis in the intestine is one the factors affecting mortality in the multivariate analysis [12]. Derici et al. reported in a study on incarcerated abdominal hernias that intestinal necrosis developing after intestinal resection extends the duration of hospital stay, and intestinal necrosis is the only factor affecting mortality as a result of multivariate analysis [13]. Mucha reported that the mortality rate was

7.7% and 16.2% in cases with simple necrosis and in cases with intestinal necrosis, respectively, in patients undergoing laparotomy due to intestinal obstruction; furthermore intestinal necrosis development is one of the factors affecting mortality in intestinal obstructions [14].

It has been suggested that APACHE II score be calculated on the day of relaparotomy using preoperative laboratory findings and physiological data. However, there have also been studies stating that APACHE II score is limited, especially in deciding relaparotomy in critical patients [14-16]. The mortality rate was 63.8% (30/47) in patients with APACHE II score of greater than 20, while it was 36.2% (6/189) in patients with APACHE II score of less than 20 in this study. It has been stated in another study that there is a significant relationship between relaparotomy necessity and APACHE II score of greater than 20 and serum albumin value of less than 3 mg/dl in patients with intra-abdominal sepsis over the age of 70 [17]. Koperna et al. reported that APACHE II score may increase postoperatively due to limitations in effective improvement of physiological changes caused by surgical stress in patients undergoing emergency surgery. As a result of this, decrease in APACHE II score shows improvement and increase in APACHE II score shows a close relationship with mortality after the postoperative 7th day in long-term inpatients [18]. The mortality has been thought to be related with high APACHE II score, number of organs in failure, and age in patients with multiple organ failure (MOF) due to sepsis [19]. It was found that specificity and sensitivity of APACHE II scores between 1-20 are high in predicting mortality, but there is no correlation between predicted and actual mortality rates at scores between 1-10 and greater than 20 in a study conducted on patients exposed to perforation due to various etiological factors such as appendicitis, typhoid, tuberculosis, cholecystitis, blunt abdominal trauma, and malignancy [20]. A significant relationship between highness in APACHE II score and obtained mortality rate was demonstrated in a study conducted on 521 patients, mostly composed of patients with severe peritonitis abdominal sepsis, abdominal trauma, acute pancreatitis, and esophagus variceal bleeding, by Giangiuliani et al. [21]. In addition, highness in APACHE II score was reported to be a significant indicator for mortality in acute ischemic intestinal diseases [22]. We found in this study that the values greater than 20 in APACHE II score, which is evaluating chronic health condition associated with acute severity of disease and age of patient, are an independent risk factor affecting mortality in relaparotomies. One fourth of surgical patients are patients over the age of 65 years, and half of patients over the age of 65 years require a surgical intervention in their remaining life [23].

The mortality rate was 66.6% (24/36) in 24 patients over the age of 50 years, while it was 6.0% (12/200) in 12 patients under the age of 50 years in this study. The mortality rate was 10.8% (16/148) in patients undergoing operation under emergency conditions, and 22.7% (20/88) in patients undergoing operation under elective conditions. Oruç et al. [24] compared emergency and elective surgery results between a patient group over the age of 60 and a patient group under the age of 60; and found the complication rate to be 35.6% and mortality rate to be 23.2% in the group over the age of 60, but lower complication (23.2%) and mortality (4.65%) rates in the group under the age of 60. As a result, they concluded that elderly age is not a single risk factor for surgery, although higher rates of comorbid diseases are observed in patients over the age of 60 years. Emergency operations, major operations, and comorbid diseases are the most important factors affecting morbidity and mortality in the patient group over the age of 60 years; furthermore, operations can be performed safely with good preoperative preparation and better clinical results can be obtained in this situation.

Many studies have been indicating high mortality risk due to infectious complications in patients undergoing blood transfusion. Suppressed immunity and pathogenic microorganisms resulting from transfusion are held responsible for infection development. The presence of many parameters have been shown in previous studies in terms of preoperative blood transfusion requirements; the most important of these parameters have been compared with primary disease, age, and gender using preoperative coagulation tests. The aim of this study was to evaluate the effect of intraoperative blood transfusion on postoperative mortality and morbidity. Postoperative mortali-

ty and reoperation rates were significantly higher in YTG patients. Duration of ICU stay and hospital stay as well as infection development rate were higher in YTG patients than DTG patients [25] (YTG) (> 4 unit erythrocyte suspension) and low transfusion group (DTG) (≤ 4 unit erythrocyte suspension). Blood of 5.8±6.47 (0-32) units on average was transfused into 236 patients undergoing relaparotomy in our study. The mortality rate was 22.4% (22/98) in 98 patients undergoing blood transfusion of more than 3 units, and 10.1% (14/138) in 138 patients undergoing blood transfusion of 0-3 units.

It has been suggested, especially more recently, that platelets have important functions in chronic inflammation, furthermore mean platelet volume (MPV) can be used as an inflammatory marker in some inflammatory diseases. It has been indicated in recent studies that increased platelet volume is observed in patients with sepsis, which can be an important parameter that can be used together with other inflammatory markers in diagnosis and the course of disease [26-28]. Dastugue et al. detected an increase in MPV in patients with septic shock in their retrospective study [29]. Increase in MPV was reported in 3-6% of infectious patients in the study of Giles [30, 31]. In reviewing literature, there has been no evidence demonstrating the relationship between MPV and relaparotomy, therefore this study is the first. The MPV value was found to be 7.83±1.92 in a group developing mortality in the univariate analysis.

In conclusion, necessary attention should be paid especially in the first operation in order to prevent complications causing relaparoto my due to the high mortality rate [32-34]. Introducing preoperative risk factors of the patient, identifying the disease most correctly upon available facilities and time, and evaluating intraoperative surgical field and technique together with patient and disease factors would help to reduce the risk of complications.

Disclosure of conflict of interest

None.

Address correspondence to: Hüseyin Eken, Department of Surgery, School of Medicine, Erzincan University, Erzincan, Turkey. E-mail: huseyineken80@hotmail.com

References

[1] Utkan NZ, Cantürk NZ, Yıldırır C, ve ark. Karın içi ameliyatı geçiren hastalarda erken relaparatomi nedenleri. Cer Tıp Bül 1995; 4: 92-94.
[2] Chang WH, Chu CH, Wang TE. Adhesive small bowel obstruction: How long can patient tolerate conservative treatment? World J Gastroentero 2003; 9: 603-605.
[3] Agalar F, Eroglu E, Bulbul M, Agalar C, Tarhan OR, Sari M. Staged abdominal repair for treatment of moderate to severe secondary peritonitis. World J Surg 2005; 29: 240-244.
[4] Unalp HR, Kamer E, Kar H, Bal A, Peskersoy M, Ali Onal M. Urgent abdominal re-explorations. World J Emerg Surg 2006; 1: 10.
[5] Hutchins RR, Gunning MP, Lucas DN, Allen-Mersh TG, Soni NC. Relaparotomy for suspected intraperitoneal sepsis afterabdominal surgery. World J Surg 2004; 28: 137-141.
[6] Ching SS, Muralikrishnan VP, Whiteley GS. Relaparotomy: a fiveyear review of indications and outcome. Int J Clin Pract 2003; 57: 333-337.
[7] Mulari K, Leppaniemi A. Severe secondary peritonitis following gastrointestinal tract perforation. Scand J Surg 2004; 93: 204-208.
[8] Uggeri FR, Perego E, Franciosi C, Uggeri FA. Surgical approach tothe intraabdominal infections. Miner Anest 2004; 70: 175-179.
[9] Mulier S, Penninckx F, Verwaest C, Filez L, Aerts R, Fieuws S, Lauwers P. Factors affecting mortality in generalized postoperative peritonitis: multivariate analysis in 96 patients. World J Surg 2003; 27: 379-384.
[10] Harbrecht PJ, Garrison RNI, Fry DE. Early urgent relaparotomy. Arch Surg 1984; 119: 369-374.
[11] Uludağ M, Yetkin G, Kebudi A,ve ark. Mekanik bağırsak tıkanıklıklarında morbidite ve mortaliteyi etkileyen faktörler. Ulus Trav Derg 2004; 10: 177-184.
[12] Fevang BT, Fevang JM, Stangeland L, Soreide O, Svanes K, Viste A. Complications and death after surgical treatment of small bowel obstruction: a 35 year institutional experience. Ann Surg 2000; 231: 529-537.
[13] Derici H, Unalp HR, Bozdag AD, Nazli O, Tansug T, Kamer E. Factors affecting morbidity and mortality in incarcerated abdominal wall hernias. Hernia 2007; 11: 341-346.
[14] Mucha P Jr. Small intestinal obstruction. Surg Clin North Am 1987; 67: 597-620.
[15] Koperna T, Semler D, Marian F. Risk stratification in emergency surgical patients: Is the

APACHE II score a reliable marker of physiological impairment? Arch Surg 2001: 136: 55-59.
[16] Koperna T, Schulz F. Prognosis and treatment of peritonitis: do we need new scoring systems? Arch Surg 1996; 131: 180-186.
[17] Myshkin KI, Bluvshtein GA, Dodin SV. Relaparotomy after operations on the rectum and colon. Vestn Khir Im I I Grek 1989; 143: 5-9.
[18] Kulkarni SV, Naik AS, Subramanian JN. APACHE-II scoring system in perforative peritonitis. Am J Surg 2007; 194: 549-552.
[19] Giangiuliani G, Mancini A, Gui D. Validation of a severity of illness score (APACHE II) in a surgical intensive care unit. Intensive Care Med 1989; 15:519-522.
[20] Hsu HP, Shan YS, Hsieh YH, Sy ED, Lin PW. Impact of etiologic factors and APACHE II and POSSUM scores in management and clinical outcome of acute intestinal ischemic disorders after surgical treatment. World J Surg 2006; 30: 2152-2162.
[21] Oskvig RM. Special problems in the elderly. Chest 1999; 115: 158-164.
[22] Ding LA, Sun LQ, Chen SX, Qu LL, Xie DF. Modified physiological and operative score for the enumeration of mortality and morbidity risk assessment model in general surgery. World J Gastroenterol 2007; 13: 5090-5095.
[23] Mansouri M, Ekjam S, Hudairi A, et al. Emergency abdominal surgery in Libyan elderly patients. Sci Med J (ESCME) 2005; 17: 57-65.
[24] Oruç MT, Uzun S, Saylam B, ve ark. İleri yaşta acil ve elektif şartlarda cerrahi tedavi. Turk J Geriatr 2004; 7: 37-40.
[25] Onur Y, Murat D, Deniz B, ve ark. Karaciğer Nakli Sonuçları Üzerinde KanTransfüzyonlarının Etkisi ve Transfüzyon Gereksinimini Etkileyen Faktörler. İnönü Üni Tıp Fak Derg 2008; 15: 87-91.
[26] Kernodle DS, Kaiser BK. Surgical and trauma-related infections. In: Mandell GL, Bennett JE, Dolin R (eds). Principles and Practice of Infectious Diseases. 5th edition. Pennsylvania: Churchill Livingstone; 2000. pp. 3177-3191.
[27] Şahin A, Ertekin C, Güloğlu R, ve ark. İstanbul Tıp Fakültesi, Genel Cerrahi Ad Ulus Trav Acil Cer Derg. Yıl 1997; 3: 233-242.
[28] Van Der Lelie J, Von Dem Borne AEG Kr. Increased mean platelet volume in septicaemia. J Clin Pathol 1983; 36: 693-696.
[29] Becchi C, Al Malyan M, Fabbri LP, Marsili M, Boddi V, Boncinelli S. Mean platelet volume trend in sepsis: is it a useful parameter? Minerva Anestesiol 2006; 72: 749-756.
[30] Dastugue N, Picheloup F, Sie P, Genestal M, Cathala B, Boneu B. Increase in meanplatelet volume in shock-related thrombocytopenia. Nouv Presse Med 1982; 11: 2899-2901.
[31] Giles C, Inglis TC. Thrombocytopenia and macrothrombocytosis in gestational hypertension. Br J Obstet Gynaecol 1981; 88: 1115-1119.
[32] Isik A, Peker K, Soyturk M, Fırat D, Yoruker U, Yılmaz I. Diagnostic evaluation and treatment of patients with rectus abdominis hematoma. Cir Esp 2015; 93: 580-8.
[33] Isik A, Eryılmaz R, Okan I, Dasiran F, Firat D, Idiz O, Sahin M. The use of fibrin glue without surgery in the treatment of pilonidal sinus disease. Int J Clin Exp Med 2014; 7: 1047-51.
[34] Isik A, Peker K, Gursul C, Sayar I, Fırat D, Yılmaz I, Demiryılmaz I. The effect of ozone and naringin on intestinal ischemia/reperfusion injury in an experimental model. Int J Surg 2015; 21: 38-44.