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Our Experience in Perioperative Medicine in Patients with Colorectal Surgery

Kolorektal Cerrahi Geçiren Hastalarda Perioperatif Bakım Deneyimlerimiz

Olcayto Uysal[1], Mustafa Süren[2], Serkan Doğru[2], Süheyla Uzun[3], Emin Daldal[4], İsmail Okan[5]

[1]Niksar State Hospital, Department of Anesthesiology and Reanimation, Tokat, Turkey
[2]Gaziosmanpaşa University, Medical Faculty, Department of Anesthesiology and Reanimation, Tokat, Turkey
[3]Gaziosmanpaşa University, Medical Faculty, Department of Internal Medicine, Tokat, Turkey
[4]Gaziosmanpaşa University, Medical Faculty, Department of General Surgery, Tokat, Turkey
[5]Gaziosmanpaşa University, Medical Faculty, Department of Surgical Oncology, Tokat, Turkey

Abstract

Aim: ERAS (Enhanced Recovery After Surgery) programmes have been becoming more important day by day. Researchers should compose these type of programmes according to the conditions of their surgical centers. In this study we aimed to demonstrate our experience on enhanced recovery after surgery protocol.

Material and Method: To optimize the patients mental and physical status; informative meetings about operation were arrenged with patients and relatives, and walking and respiratory exercises were given to patients. Patients were received either spinal or epidural analgesia for postoperative pain management. After operation patients were followed up at surgical intensive care unit and surgery ward. Pain scores and clinical status of the patients were evaluated.

Results: A total of 65 patients were included in this retrospective study. Numerical Rating Scale (NRS) scores found significantly lower in thoracal epidural analgesia group than spinal analgesia group at 6., 12., 24., 48. hours (p=0.036; p=0.002; p=0.002; p=0.003 respectively). Early mobilizated patients oral intake and first flatus time were much earlier.

Conclusions: Positive qualitative clinical impacts were determined on patients. Controlling pain at postoperative period is an important part of enhanced recovery programmes. Our protocol was about colorectal surgeries in our hospital but we believe that enhanced recovery protocols should be used for different type of surgeries widespread

Keywords: Colorectal surgeries, enhanced recovery, pain, spinal, thoracal epidural

Öz

Amaç: ERAS (Enhanced Recovery After Surgery) programları gün geçtikçe daha da önem kazanmaktadır. Araştırmacılar bu tür programları cerrahi merkezlerinin şartlarına uygun olarak oluşturmalıdır. Bu çalışmada ameliyat sonrası hızlandırılmış iyileşme protokolü üzerine kendi deneyimlerimizi sunmayı amaçladık.

Gereç ve Yöntem: Hastaların mental ve fiziksel durumlarını optimize etme amaçlı ameliyattan önce hasta ve yakınlarıyla operasyon hakkında bilgilendirici görüşmeler ayarlandı ve hastalara yürüme ve nefes egzersizleri yaptırıldı. Operasyondan sonra hastalar cerrahi yoğun bakım ünitesinde ve cerrahi servisinde takip edildi. Hastaların ağrı skorları ve klinik durumları kayıt edildi.

Sonuç: Bu retrospektif çalışmaya 65 hasta dahil edildi. Numerical Rating Scale (NRS) skorları epidural analjezi alan grupta spinal analjezi alan gruba göre 6., 12., 24., 48. saatlerde anlamlı derecede düşük bulundu (sırasıyla p=0,036; p=0,002; p=0,002; p=0,003). Erken mobilize edilen hastalarda oral alım ve gaz çıkarmanın daha erken başladığı görüldü.

Tartışma: Hastalar üzerinde pozitif kalitatif klinik etkiler gözlemlendi. Postoperatif periyotta ağrı kontrolü hızlandırılmış iyileşme programlarının önemli bir bileşendir. Bizim uyguladığımız protokol hastanemizdeki kolorektal cerrahiler hakkındaydı fakat biz hızlandırılmış iyileşme protokollerinin farklı cerrahilerde de yaygın bir biçimde kullanılması gerektiğine inanmaktayız.

Anahtar Kelimeler: Kolorektal cerrahiler, hızlandırılmış iyileşme, ağrı, spinal analjezi, torakal epidural analjezi

Corresponding *(İletişim)*: Olcayto Uysal, Niksar State Hospital, Department of Anesthesiology and Reanimation, Niksar, Tokat, Turkey
E-mail *(E-posta)*: uolcayto@gmail.com
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INTRODUCTION

Colorectal cancers are one of the leading causes of cancer-related mortality and morbidity with an incidence of 23.1 in 100.000 male and 14.4 100.000 female population in Turkey.[1] Colorectal cancer predominately affects the older population in whom the geriatric comorbidities and physiological changes might complicate the surgical outcome. Elective colorectal surgeries are also the reason of perioperative morbidity.[2] Perioperative management is an important denominator to indicate the high-quality health care by decreasing the postoperative morbidity in these patients.[3]

Perioperative medicine is a developing field where a multidisciplinary approach to perioperative period is ensued by surgeons, anesthesists and internists. The main purpose of the discipline is to optimize the physiological condition of the high-risk patients for the operation. By this way, patients get better and turn to normal life faster, complication rates decrease nearly by 50% and the length of hospital stay is significantly shorter.[4,5]

Many studies have been conducted in developed countries on perioperative medicine and various evidence-based protocols have been developed recently. Enhanced Recovery After Surgery (ERAS) protocol, a modification of the perioperative medicine concept of Henrik Kehlet, a Danish surgeon,[6] and CHEERS DREAM (Carbohydrate loaded, Hydrated, Euvolemic, Eunatremic, Ready to Start, DRinking, EAting, Mobilising) are among others.[7]

The ERAS protocol consists of common items such as providing minimal fasting time, postoperative analgesia, no routine bowel clearance, early mobilization and early feeding.[8] They are independent of each other, but are directed at the same target, reducing surgical stress and optimizing the patient physically and mentally.[9] Since the end point is the result of the cumulative effect of each theme, it is difficult to assign the impact of any single of the themes. We have been utilizing a perioperative care protocol, mainly based on the ERAS protocol in patients who underwent colorectal surgery in Tokat Gaziosmanpaşa University Hospital since 2014. In this study, we aimed to compare the effect of spinal and thoracic epidural analgesia on postoperative pain in patients who underwent ERAS protocol after colorectal surgery.

MATERIAL AND METHOD

This study was performed in Gaziosmanpaşa University Medical Faculty Hospital. Before the study commenced, the study was carried out with the permission of Gaziosmanpaşa University Medical Faculty Clinical Researches Ethics Committee (Date: 26.12.2017, Decision No: 15-KAEK-093). A perioperative team was established since 2014 with the participation of a surgical oncologist (IO), internist (SU) and anesthesiologist (MS) to pursue the aim of providing a standart care for surgical oncology patients. A perioperative checklist protocol for colorectal surgery was introduced in general surgery ward. The protocol covered the preoperative preparation of the patient and postoperative follow-up instructions on daily basis adapted from ERAS protocol. Only the patients with colorectal cancer aged between 18 and 81 years, with ASA score I-IV according to the American Society of Anesthesiologists (ASA) classification who were scheduled for curative surgery were included to the study. The ones who had mental problems (like Alzheimer's diseases), disoriented (i.e. with delirium), were operated under emergency conditions and with non-curative surgery and unwilling to enroll to the study were excluded. The study period comprised the time between 2014 and 2017. The data were collected prospectively and evaluated retrospectively.

The patients with colorectal cancer was discussed in multidisciplinary tumor meeting. After the decision of surgery, the patients were evaluated preoperatively by a periopearative team comprising a surgical oncologist, an internist and anesthesiologist. The patients planned to undergo colorectal surgery were evaluated by the same anesthesiologist and the internal medicine specialist in the perioperative period to minimize the bias. The time between the first diagnosis and operation was practiced to educate and train the patients about perioperative management. The educations were performed in a face to face manner. For example, the use of incentive spirometer (6 times the daily for 5 minutes) was taught and then encouraged for spirometer study until the operation day. Walking (at least 3 km/day on a horizontal level) exercises were suggested and the patients were encouraged to quit smoking if they smoke. All patients were informed about the pain management postoperatively and taught Numerical Rating Scale (NRS) for the evaluation of the postoperative pain severity.

On the morning of surgery, patients were taken to the operating table where electrocardiography (ECG), non-invasive arterial blood pressure and venipuncture were performed. The choice of regional anesthesia either spinal or thoracal epidural catheterization was left to the discretion of the anesthesist. For spinal anesthesia, Morphine 0.3 mg intrathecal and bupivacaine 5 mg were administered in patients with spinal analgesia. Five minutes after an intervention, a pinprick test was performed on the lower extremities to identify whether the drug reached the subarachnoid space or not. In another group of patients, thoracal epidural catheters were placed at T7-T12 level. Before the patient was anesthetized, 10 ml of 0.125% bupivacaine was administered through the thoracic epidural catheter, and then a pinprick test was performed on the lower extremities to assess whether the drug was in epidural space or not. After the pinprick test, the mixture we prepared for postoperative analgesia was given from the thoracic epidural catheter at an infusion rate of 0.1 ml/kg/h (a total of 100 ml including the mixture of bupivacaine 0.125% and morphine and saline 50 mcg/ml). fentanyl 2 mcg/kg, thiopental 5 mg/kg, rocuronium 0.6 mg/kg intravenous (IV) was administered to all patients during anesthesia induction. Anesthesia was maintained with 50% of O_2, air, and sevoflurane. Patients were heated with a heater blanket. Tramadol 100 mg IV and paracetamol 1 gr IV were administered half an hour before the end of the operation. After

extubation, the patients were monitored in surgical intensive care for 24 hours. The first mobilization time after the operation was recorded for all patients. Analgesic drugs were administered according to our postoperative pain protocol. The pain protocol included paracetamol 1 gr IV three times a day and tramadol 100 mg IV three times a day, for the first day or until an oral intake. Pain severity was assessed with the Numerical Rating Scale (NRS) (1=mildest pain, 10=the most severe pain). If NRS is four or above, additional tramadol 100 mg was administered, and if NRS did not decrease under four, additional paracetamol 1 gr IV was administered. After the first day, paracetamol 1 gr oral three times a day and dexketoprofen 25 mg orally twice a day were administered to patients if oral intake was possible.

Patients' respiratory rate, heart rate, pain severity (NRS), blood pressure, first flatus time, first defecation time, first oral solid food intake time, headache (if there was or not), and other complications (wound infection, anastomosis leak) and time of discharge toward were recorded by examining patient files.

The distributions of the data were analyzed by one sample Kolmogorov-Smirnov test. Numerical data were shown as mean and standard deviation; categorical data were shown as frequency and percentage. The Mann Whitney-U test was used to compare the mean values of the numerical data while the Chi-square test was used for the categorical data. Linear regression analysis was used to investigate the effect of other possible markers on a variable. The relationship between two variables were analyzed by Pearson correlation analysis (r). We analyzed all the data by the Statistical Package for Social Sciences 20.0 (SPSS Inc. Chicago, IL) program. Statistical significance for all analysis was set to $p<0.05$.

RESULTS

Demographic and Clinical Features of the Patients

Of the 65 patients enrolled in this study, 34 were male (52.3%) and 31 were female (47.7%). 44 patients (67.7%) were operated for colon cancer while 21 patients (32.3%) for rectum cancer. 28 patients (43.1%) underwent open surgery while 37 patients (56.9%) were operated by laparoscopic surgery. Four patients (6.2%) had the ASA physical status of I, 25 (38.5%) as II, 35 (53.8%) as III and one patient (1.5%) as IV.

Five patients (7.7%) were the smoker, while 60 patients (92.3%) were the non- smoker. Demographic characteristics of the patients and the type of cancers were presented in **Table 1** and **Table 2**, respectively. Body Mass Index (BMI) was 27.41±5.17 in the females and 25.33±4.34 in the males.

Table 1. Patient demographics

	Female	Min-Max	Male	Min-Max
Number of patients	31 (47.7%)	-	34 (52.3%)	-
Mean age	60.74	(23-83)	62.18	(37-91)
Mean height (cm)	157.81	(149-167)	170.59	(150-182)
Mean weight (kg)	67.97	(48-95)	74.21	(43-104)
Mean BMI (kg/m²)	27.41	(17.93-36.98)	25.33	(16.80-34.75)

Table 2. Cancer types in female and male gender

Type of cancer	Female		Male		Total
	number	%	number	%	Number
Colon cancer	22	71	22	64.7	44
Rectum cancer	9	29	12	35.3	21
Total	31	100	34	100	65

Perioperative Features of the Patients

Only 15 patients (13.8%) had nausea at the 6th hour of postoperative period. In the postoperative 48th hour, bowel sounds were found to be normoactive in 32 patients (49.2%), hypoactive in 22 patients (33.8%), hyperactive in three patients (4.6%) and 8 patients (12.3%) had no bowel sounds.

The mean postoperative mobilization time of the patients was 22.53±11.52. Between early mobilization time, and first flatus time there was a positive weak correlation ($\rho=0.321$, $p=0.015$). Additionally, mobilization time and first oral solid intake time had a positive weak correlation ($\rho=0.304$, $p=0.024$)

Three patients had postoperative wound infection and three had a postoperative headache. Mean discharge time was 198.19±103.1 hours. Respiration rate, mean artery pressure, pulse per minute and NRS scores (1st, 2nd, 6th, 12th, 24th, 36th, 48th hours) recorded in the postoperative follow-ups are shown at **Figure 1. Table 3** demonstrates the oral solid food intake, float and defecation time, mobilization time (the first time of observation at the postoperative period) and discharge time.

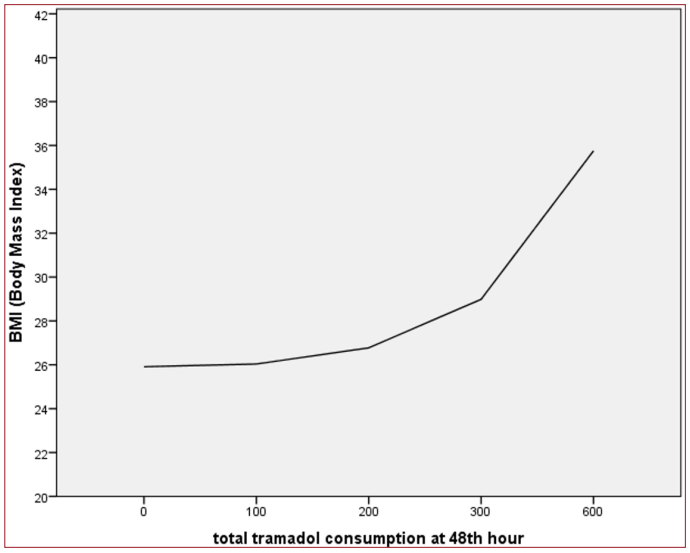

Figure 1. The relationship between body mass index and tramadol consumption

Tablo 3. Postoperative follow-ups

	Number of patients (n)	Mean±SD (hour)	Min-Max (hour)
Postoperative oral solid intake time	56	75.77 (±35.186)	25-192
Postoperative flatus time	65	36.89 (±18.958)	8-96
Postoperative stooling time	63	57.25 (±27.283)	12-120
Postoperative mobilization time	57	22.53 (±11.523)	8-72
Discharge time	62	198.1 (±103.188)	66-552

Postoperative Pain and Associated Factors

The type of surgery (Laparoscopic or open surgery) had no effect on postoperative pain severity. (β=-.235, p=0,059). Furthermore, the total consumption of paracetamol and tramadol during 48 hours after the surgery didn't differ significantly between laparoscopic and open surgery (p=0.894; p=0.113, respectively).

Pain severity measured at 1st, 2nd, 6th, 12th, 24th, 36th, 48th hours postoperatively between males and females revealed no significant difference (p=0.240; p=0.472; p=0.530; p=0.880; p=0.317; p=0.275; p=0.428, respectively). Total paracetamol and tramadol use at 48th hours were also not significantly different between males and females (p=0.114; p=0.925, respectively). There was a positive weak significant correlation between BMI and total tramadol consumption (ρ=0.247, p=0.047; **Figure 2**).

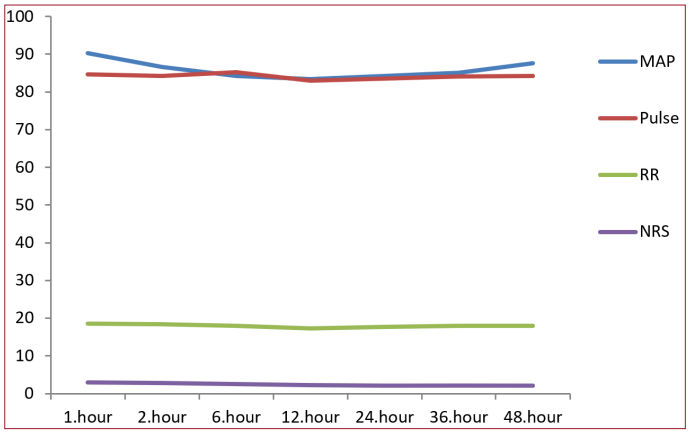

Figure 2. Postoperative follow-ups.
MAP: Mean Artery Pressure, RR: Respiration Rate, NRS: Numerical Rating Scale

Thoracal Epidural vs. Spinal Analgesia

47 patients (66.2%) were administered spinal morphine while in 18 patients (33.8%) thoracal epidural catheter was inserted. Comparisons of age, gender, tumor type, operation type and discharge time in these groups are shown in **Table 4**. Patients with thoracal epidural analgesia were found to have significantly lower NRS scores at postoperative 6th, 12th, 24th, 48th hours compared to those with spinal analgesia (p=0.036; p=0.002; p=0.002; p=0.003, respectively). Comparison of NRS scores in thoracal epidural analgesia and spinal analgesia is shown in **Table 5**. Postoperative nausea was not significantly different between thoracal and spinal analgesia group in the postoperative first hour (p=0.376).

Table 4. Comparison of age, gender, tumor type, operation type and discharge time in thoracal epidural and spinal analgesia

Parameters	Spinal analgesia	Epidural analgesia	p value
Age	60.60±13.180	63.83±10.662	p=0.329
Gender	Female: 25 Male: 22	Female: 6 Male: 12	p=0.151
Tumor type	Colon tumor: 32 Rectum tumor: 15	Colon tumor: 12 Rectum tumor: 6	P=0.913
Operation type	Open surgery: 22 Laparoscopy: 25	Open surgery: 6 Laparoscopy: 12	p=0.326
Discharge time	204.84±110.77	180.59±79.97	P=0.624

Table 5. Difference of NRS scores in thoracal epidural analgesia and spinal analgesia

Time (hour)	Thoracal Epidural Analgesia		Spinal Analgesia		p value
	Mean NRS	Standart Deviation	Mean NRS	Standart Deviation	
1. hour	2.44	1.381	3.17	1.434	0.079
2. hour	2.22	1.263	2.96	1.285	0.058
6. hour	2.11	1.079	2.62	0.945	0.036
12. hour	1.61	0.850	2.53	1.080	0.002
24. hour	1.56	0.616	2.34	1.147	0.002
36. hour	1.78	0.808	2.24	0.786	0.068
48. hour	1.61	0.778	2.36	0.919	0.003
Total number of patients (n)	18		47		

DISCUSSION

This study, which we aimed to present our experience about colorectal cancers, found that thoracal epidural analgesia is better than spinal analgesia. However, both techniques were successfully to control pain at the postoperative period (in all patients the NRS scores were under four). Furthermore, there was no statistical difference in discharge times between these techniques. The study also revealed that first flatus time and first oral solid food intake seemed to be early in patients with early mobilization.

The protocol we use in colorectal surgeries in our hospital is influenced by the ERAS protocol and one of the first steps of our protocol is informing the patients and their relatives preoperatively. The indication of surgery by Cancer Surgery Clinic and their relatives are consulted to Anesthesiology and Internal Medicine doctors a week before the operation to optimize their conditions and receive information about the treatment of their comorbidities.

Pain, one of the most important components of the symptom cluster in cancer patients,[10] is known to have an impact on patients both physiologically and emotionally. One of the main targets of ERAS is postoperative analgesia.[11] Postoperative pain is an important problem that increases the morbidity of a patient in major abdominal surgeries. Fortunately, there are various analgesia methods that can be used in postoperative analgesia. For example; spinal, thoracal epidural and intravenous methods can be used either alone or combined in lower abdominal surgeries. In a study evaluating postoperative analgesia methods in colorectal cancer operations, it has been shown that spinal and thoracal epidural morphine provide better results in pain palliation than IV morphine.[12] In another study patients undergoing thoracal epidural morphine had lower pain scores than the other analgesia methods.[13] Spinal morphine is simple in practice, significantly reduces the intravenous opioid consumption and found to be cost-effective than epidural analgesia or peripheral nerve blocks.[14] Effective analgesic treatment in the postoperative period provides rapid healing as well as helping to reduce complications such as sleeping disorders or increased stress response.[4,12] Besides, effective postoperative

pain management may lead to early patient mobilization, early oral intake and reduced weight loss.[15] Another crucial goal in the management of postoperative analgesia is the ability to control pain with oral analgesics, which is important for the discharge of the patient.[5,6]

One of the well-known complications of spinal morphine is a postspinal headache and the frequency is about 0.1% and 36%.[16] A headache occurs due to cerebrospinal fluid (CSF) leak at the injection site and typically begins within the first 48 hours after intervention.[17] Two of our patients had a postspinal headache (4.16%). A postspinal headache can seriously impair the quality of life of the patient. This is an important point that anesthesia doctors should take into account for postoperative pain management.

Furthermore, postoperative nausea rates at 24th and 48th hours were 13.9% (n=58) and 8.6% (n=58), respectively. In a study by Barclay et al. 12% of the patients had nausea on the first postoperative day and 20-25% on the 1st-4th postoperative days.[18] There are several studies evaluating postoperative nausea and vomiting, however factors such as surgical procedure, comorbidities, surgery type etc. may lead to difficulties making comparison among the outcomes of these studies.[18]

Prolonged immobilization period leads to loss of muscle strength and muscle mass.[6] Another component of our protocol was the early mobilization of patients, and the physical capacities of the patients were tried to be optimized by preoperative walking. Likewise, the patients were tried to be mobilized at the earliest possible time after the operations. Early mobilization, which reduces the incidence of deep vein thrombosis (DVT), plays an important role in enabling the patients to return to their daily routine.[19] The earlier the mobilization starts, the less constipation develops. Early mobilization also decreases pulmonary complications like atelectasis in the postoperative period.[4,20,21] For these reasons, its role is significant in patients' returning to daily life. In our study, we've seen that early mobilization results in earlier flatus and lower constipation rates.

The stimulation of intestinal motility in the postoperative period is important for early enteral intake. A study by Yamada et al. on gastric surgery indicated that the ERAS group had earlier flatus and stooling and earlier oral intake than the control group.[9] Bowel sounds of nearly half of our patients were either hypoactive or absent. At the 48th hour postoperatively, 22 patients' (12 for spinal analgesia and 10 for thoracal epidural analgesia) bowel sounds were hypoactive and in 8 patients (5 for spinal analgesia and 3 for thoracal epidural analgesia) there were no bowel sounds, and analgesic use of morphine might be related to these results.

The ERAS protocol, prepared for colorectal cancers, has begun to gain more supporters over time. Nowadays, there are different protocols developed for various surgical branches, not only for colorectal surgeries.[22-24] Morbidity and mortality rates decreased in colorectal surgeries, which are one of the major abdominal surgical procedures on account of the application of the ERAS protocol.[7,25] The purpose of the ERAS protocol is to prepare the preoperative patients physically and psychologically for the operation; to prevent complications that may occur during and after the operation; to manage the complications in the best way, if developed any; and to follow patients with common protocols in the guideline of evidence-based medicine so as to make them return to everyday life in the postoperative period as soon as possible.

One of the most important points of this protocol is to follow up patients with the principles of multidisciplinary and interprofessional approach.[24,25]

Unlike the classical approach, anesthesists task starts preoperatively as soon as the patient has an indication for surgery. They manage the patients anesthesia in the operating room, follow up them to prevent complications until they are discharged postoperatively. At home after discharge, they continue to maintain perioperative care, especially pain treatment if necessary.

The term "perioperative medicine" is a specialty at some universities in developed countries such as Canada, Australia, United Kingdom, and the United States in the world. As a result of the major studies done in this new area, clinical improvements are observed in patients and hospital costs are seriously reduced.

Our study has some limitations. As well as being a monocentric study and the number of patients included in the study was relatively small. We followed up our patients for pain palliation and clinical recovery rather than cost-effectiveness. If our study involved the cost-effectiveness of the patients, it could have been described as being more comprehensive.

CONCLUSIONS

In this study performed in a university hospital, the effects of our perioperative medicine protocol modified from the ERAS protocol on the patients who underwent colorectal surgery were investigated. The fact that the anesthetic methods have no effect on the discharge time and the VAS scores are below 4 in both methods suggests that both spinal and thoracal epidural methods can be used in terms of postoperative analgesia. The positive contribution of this protocol is seen qualitatively on patients in our clinic, however, we suggest that multicentred, prospective, and more comprehensive studies involving the larger amount of patients are needed in order to objectively evaluate the outcomes of the ERAS protocol.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Gaziosmanpaşa University Medical Faculty Clinical Researches Ethics Committee (Date: 26.12.2017, Decision No: 15-KAEK-093).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. İlter H. Keskinkılıç B. 2015 Yılı İlk 10 Kanser. Türkiye Kanser İstatistikleri 2015, Halk Sağlığı Genel Müdürlüğü, Sağlık Bakanlığı, Ankara:2018.
2. Mamidanna R, Burns EM, Bottle A, et al. Reduced risk of medical morbidity and mortality in patients selected for laparoscopic colorectal resection in England:a population-based study. Arch Surg 2012;147(3):219-27.
3. Casanova MPR. Time to change the objectives hemodynamic to guide the perioperative fluid management? Glob J Perioperative Med 2017;1(1):1-3.
4. Fawcett WJ, Mythen MG, Scott MJP. Enhanced recovery:more than just reducing length of stay? Br J Anaesth 2012;109(5):671-4.
5. Bozkırlı BO, Gündoğdu RH, Ersoy PE, Akbaba S, Temel H, Sayın T. Did the ERAS protocol affect our results in colorectal surgery? Ulus Cerrahi Derg 2012;28(3):149-52.
6. Ersoy E, Gündoğdu H. Enhanced recovery after surgery. Ulus Cerrahi Derg 2007;23(1):35-40.
7. Levy N, Mills P, Mythen M. Is the pursuit of dreaming (drinking, eating and mobilising) the ultimate goal of anaesthesia? Anaesthesia 2016;71:1008-12.
8. Wind J, Hofland J, Benedikt P, et al. Perioperative strategy in colonic surgery:LAparoscopy and/or FAst track multimodal management versus standart care (LAFA trial). BMC Surg 2006;6:16.
9. Yamada T, Hayashi T, Haruhiko C, et al. Usefullness of enhanced recovery after surgery protocol as compared with conventional perioperative care in gastric surgery. Gastric Cancer 2012;15:34-41.
10. Süren M, Doğru S, Önder Y, et al. The evaluation of symptom clusters in patients with the diagnosis of terminal stage cancer. Agri 2015;27(1):12-7.
11. Levy BF, Scott MJP, Fawcett WJ, Day A, Rockall TA. Optimizing patient outcomes in laparoscopic surgery. Colorectal Dis 2011;13:8-11.
12. Ayvaz H, Düger C, Bulut F, et al. Effects of pre-emptive intravenous, spinal and epidural morphine on early postoperative analgesia and stress response. Cumhuriyet Med J 2013;35:363-72.
13. Levy BF, Scott MJ, Fawcett W, Fry C, Rockall TA. Randomized clinical trial of epidural, spinal or patient-controlled analgesia for patients undergoing laparoscopic colorectal surgery. Br J Surg 2011;98(8):1068-78.
14. Fares KM, Mohamed SA, Abdel-Ghaffar HS. High dose intratecal morphine for major abdominal cancer surgery:a prospective double-blind, dose-finding clinical study. Pain Physician 2014;17(3):255-64.
15. Carli F, Baldini G. Perioperative Pain Management & Enhanced Outcomes. In:Butterworth JF, David MC, Wasnick JD (editors). Morgan&Mikhail's Clinical Anesthesiology. 5th ed. McGraw-Hill;2013. pp.1087-105
16. Jabbari A, Alijanpour E, Mir M, Hashem NB, Rabiea SM, Rupani MA. Postspinal puncture headache, and old problem and new concepts:review of articles about predisposing factors. Caspian J Intern Med 2013;4(1):595-602
17. Turnbull DK, Shepherd DB. Post-dural puncture headache:pathogenesis, prevention and treatment. Br J Anaesth 2003;91(5):718-29.
18. Barclay KL, Zhu YY, Tacey MA. Nausea, vomiting and return of bowel function after colorectal surgery. ANZ J Surg 2015;85:823-8.
19. Pearse EO, Caldwell BF, Lockwood RJ, Hollard J. Early mobilisation after conventional knee replacement may reduce the risk of postoperative venous thromboembolism. J Bone Joint Surg Br 2007;89:316-22
20. Muehling BM, Halter GL, Schelzig H et al. Reduction of postoperative pulmonary complications after lung surgery using a fast track clinical pathway. Eur J Cardiothorac Surg 2008;34:174-80.
21. Huang J. Enhanced recovery after surgery (ERAS) protocols and perioperative lung protection. J Anesth Perioper Med 2014;1:50-6.
22. Bugada, D, Bellini V, Fanelli A et al. Future perspectives of ERAS:a narrative review on the new applications of an established approach. Surg Res Pract 2016;Article ID:3561249.
23. Kelliher L, Jones C, Day A. Optimising perioperative patient care:'enhanced recovery' following colorectal surgery. J Perioper Prac 2011;21(7):239-43.
24. Kelliher LJS, Jones CN, Fawcett WJ. Enhanced recovery for gastrointestinal surgery. BJA Educ 2015;15 (6):305-10.
25. Bayar ÖÖ, Bademci R, Sözener U, Tüzüner A, Karayalçın K. Major karaciğer rezeksiyonunda ERAS protokolü. Okmeydanı Tıp Dergisi 2013;29(3):135-42.