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Research

What Changes the Sequence of Procedures in Synchronous Upper and Lower Gastrointestinal Endoscopy?

Senkronize Üst ve Alt Gastrointestinal Endoskopide İşlem Sırası Ne Değiştirir?

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ABSTRACT

Objective: Bidirectional endoscopy (BDE) refers to esophagogastroduodenoscopy (EGD) and colonoscopy were performed consecutively on the same day. With the widespread use of cancer screening, the question arises of whether EGD or colonoscopy should be performed first. We sought to determine whether EGD or colonoscopy should be performed first in patients undergoing BDE.

Methods: Between February 10 and September 10, 2023, patients who underwent BDE were randomly divided into two groups. Demographic data, EGD duration, colonoscopy duration, transition time, total procedure time, need for additional anesthesia dose, complication status, and patient and endoscopist satisfaction were recorded. Data of a total of 291 patients were evaluated.

Results: A total of 103 patients in the EGD group (group I) and 95 patients in the colonoscopy group (group II) were included in the study. One hundred and seven (54.0%) of the patients were female. The median age of the patients was 59 (18-84) years. The median EGD time was 3 (2-11) min. Inter-procedural transit times were also evaluated. The median duration was 3 (1-6) minutes in group I and 3 (1-8) minutes in group II (p=0.044). The satisfaction of the endoscopists was also questioned. Endoscopist satisfaction was 8.66±1.00 in Group I and 8.12±1.31 in group II (p=0.001). Patient satisfaction was 9.04±0.85 in group I and 8.84±1.29 in group II (p=0.183).

Conclusion: Both procedures are applicable primarily to BDEs. Our study showed that they were not significantly superior to each other. Endoscopist preference will continue to be at the forefront of procedure selection.

Keywords: Bidirectional endoscopy, esophagogastroduodenoscopy, colonoscopy, endoscopist satisfaction, patient satisfaction

ÖZ

Amaç: Çift yönlü endoskopi (BDE), aynı gün içinde ardışık olarak yapılan özofagogastroduedonoskopi (EGD) ve kolonoskopiyi ifade eder. Kanser taramasının yaygınlaşmasıyla birlikte, EGD'nin mi yoksa kolonoskopinin mi önce yapılması gerektiği sorusu ortaya çıkmaktadır. BDE işlemi uygulanan hastalarda önce EGD mi yoksa kolonoskopi mi yapılmalıdır sorusuna yanıt aradık.

Gereç ve Yöntem: 10 Şubat-10 Eylül 2023 tarihleri arasında BDE uygulanan hastalar rastgele iki gruba ayrıldı. Demografik veriler, EGD süresi, kolonoskopi süresi, geçiş süresi, toplam işlem süresi, ek doz anestezi ihtiyacı, komplikasyon durumu, hasta ve endoskopist memnuniyeti kaydedildi. Toplam 291 hastanın verileri değerlendirildi.

Bulgular: İlk işlem olarak EGD uygulanan grupta (grup I) toplam 103 hasta ve kolonoskopi uygulanan grupta (grup II) toplam 95 hasta çalışmaya dahil edildi. Hastaların 107'si (%54,0) kadındı. Hastaların ortanca yaşı 59 (18-84) yıldı. Popülasyondaki ortanca EGD süresi 3 (2-11) dakika idi. Prosedürler arası geçiş süreleri değerlendirildi. Grup I'de ortanca 3 (1-6) dakika, grup II'de ise 3 (1-8) dakika idi (p=0,044). Endoskopistlerimizin memnuniyeti sorgulandı. Endoskopist memnuniyeti grup I'de 8,66±1,00 iken grup II'de 8,12±1,31 idi (p=0,001). Hasta memnuniyeti Grup I'de 9,04±0,85 ve grup II'de 8,84±1,29 idi (p=0,183).

Sonuç: Her iki prosedür de BDE'lerde öncelikli olarak uygulanabilir. Çalışmamız birbirlerine anlamlı üstünlükleri olmadığını göstermiştir. İşlem önceliği seçiminde endoskopist tercihi ön planda olmaya devam edecektir.

Anahtar Kelimeler: Çift yönlü endoskopi, özofagogastroduedonoskopi, kolonoskopi, endoskopist memnuniyeti, hasta memnuniyeti

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INTRODUCTION

Gastric and colorectal cancers rank among the top five most prevalent types of cancer worldwide (1,2). Gastrointestinal endoscopy is a common screening method for screenings worldwide (3). Gastrointestinal tract cancers are detected at an early stage in Japan and Korea based on advanced screening programs (4). However, the incidence of survival is high (4,5). Bidirectional endoscopy (BDE) involves consecutive esophagogastroduodenoscopy (EGD) and colonoscopy on the same day. BDE is mainly used to investigate positive fecal occult blood tests, iron deficiency anemia, and the cause of bleeding (6). When the literature was reviewed, there was no consensus among the endoscopists who performed the procedure about which procedure should be performed first in BDE (7-10). To contribute to the literature, we evaluated the variability in the procedure order in BDEs performed in our endoscopic procedure unit.

METHODS

Prospectively recorded data related to the study were retrospectively evaluated between February 10 and September 10, 2023. The current study aimed to investigate the optimal sequence for EGD or colonoscopy among patients undergoing BDE. At our tertiary care medical center's endoscopic unit, patients scheduled for BDE for screening were randomly assigned to undergo either EGD or colonoscopy first using a closed envelope method. Subsequently, the patients were divided into two groups and evaluated. Age, gender, body mass index (BMI), blood pressure, saturation, pulse rate, American Society of Anesthesiologists (ASAs) score, gagging during the procedure, EGD time (minutes), colonoscopy time (minutes), transition time between both procedures (minutes), total procedure time (time from anesthesia induction to the end of the procedures, minutes), ileocecal intubation, need for additional dose of anesthesia, and complication status were recorded. The satisfaction of both the endoscopist and patient was evaluated and documented after the procedure [visual analog scale score (1: Very bad, 10: Very good)]. Emergency endoscopic procedures (active bleeding, obstruction), colonoscopic polypectomy or colonoscopic lesion biopsy during the procedure, inadequate bowel preparation, and inaccessible cecum were excluded from the study. A week after surgery, patients were interviewed regarding the possibility of pulmonary infection. The relevant data were then analyzed retrospectively. The endoscopic procedures were performed by five endoscopists at our facility. All endoscopists had at least 5 years of experience in their field. Our endoscopy unit is open five days a week. The unit actively performs procedures approximately 08-16 hours. Endoscopists with 5 years of experience used single-channel endoscopes (EPX-3500 HD, Fujifilm, Singapore; EPK-i5000, Pentax, Japan) for endoscopic procedures. All patients were fasted for 12 hours before the procedure. For oropharyngeal anesthesia, 10% lidocaine spray (IMS Limited, So. El Monte, USA). All patients received midazolam intravenous (i.v.) (2-5 mg) (CURAMED Pharma, Karlsruhe, Germany) and i.v. propofol (1 mg/kg) i.v. (Fresenius Kabi, Hafnerstrasse, Austria) for induction before the procedure. In cases of clinical necessity and need, propofol 0.5 mg/kg was administered additionally. Biopsy was performed during all EGD procedures. The endoscope and colonoscope were cleaned using separate devices before the procedure. The device disinfection and drying process were also applied. Protective equipment such as gloves, aprons, etc.

Were changed during procedure transitions. To prevent bacterial transmission, the procedure area was cleaned, and the drapes used during the procedure were changed. The data of 291 patients were retrospectively evaluated. We excluded 93 patients who did not meet the inclusion criteria. Patients who first underwent EGD were referred to group I, and patients who first underwent colonoscopy were referred to group II. Group I consisted of 103 patients, and group II consisted of 95 patients (Figure 1). Both groups were compared according to the evaluation criteria.

Ethical Consideration

The Bandırma Onyedi Eylül University Rectorate Health Sciences Non-Interventional Research Ethics Board granted approval for the study on (date: 21/12/2023, decision no: 2023-184). The study was carried out in compliance with the principles outlined in the Declaration of Helsinki.

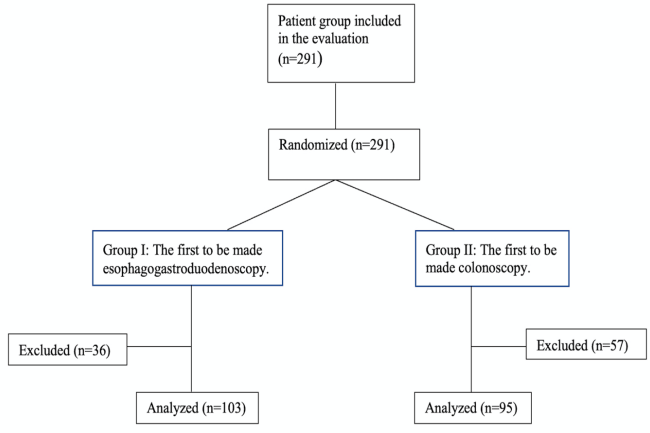

Figure 1. Sample collection scheme

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (version 26.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics were used, presenting numerical values in the form of median (minimum-maximum) or mean ± standard deviation, while categorical variables were expressed as frequency and percentage. The normal distribution of numerical variables was assessed using the Kolmogorov-Smirnov test, histogram analysis, and Skewness and Kurtosis data. To examine the uniformity of the numerical parameters across different groups, Levene's test was employed. To compare normally distributed variables between two independent groups, an independent t-test was used, and the Mann-Whitney U test was applied for non-normally distributed parameters. The relationship between binary categorical groups was analyzed using the chi-square test and Fisher's exact test. A significance level of $p<0.05$ was considered.

RESULTS

In this study, 291 patients were randomly included in the BDE plan. Subsequently, 103 patients were included in group I, which first underwent EGD. The exclusion criteria. In the group that underwent colonoscopy first (group II), 95 patients were included. When the entire patient population was detailed according to sex, the female population constituted the majority, with 107 (54.0%) patients. The average age of all patients was 59 years (range, 18-84 years). There were no significant differences in demographic data between the groups. Prior to the procedure, BMI, ASAs scores, systolic and diastolic blood pressure, pulse rate, and saturation were assessed. There were no statistically significant differences in the evaluated data between the groups (Table 1).

The EGD procedure times were evaluated. The median EGD time was 3 (2-11) minutes. In group I, the median EGD time was 4 (2-11) minutes, while in group II, it was 3 (2-8) minutes (p=0.173). The median duration of the colonoscopy procedure was 10 minutes (range: 6-18 minutes). The median duration was 10 minutes (range: 6-18) in group I and 10 minutes (range: 6-15) in group II (p=0.428). The transition time from EGD to colonoscopy in group I and that from colonoscopy to EGD in group II were evaluated. The median was calculated as 3 (1-6) minutes in group I and 3 (1-8) minutes in group II (p=0.044). The BDE times were then calculated. When the entire population was analyzed, the median BDE was calculated to be 17 (10-25) minutes. In group I, the median BDE time was 17 minutes (range: 11-25). In group II, the median duration of BDE was 17 minutes (range: 10-24) (p=0.808) (Table 2).

Complications during EGD and colonoscopy were evaluated. Complications developed in 6 patients. 3.03% of the entire population were patients. The groups were evaluated internally. Complications were noted in three patients in group I and one patient in group II (p=0.92). When the complications were detailed, cardiopulmonary complications occurred in 2 patients, dental trauma in 1 patient, lower gastrointestinal perforation in 2 patients and bleeding in 1 patient. No pulmonary infection or upper gastrointestinal perforation were not observed in

Table 1. Demographic data, ASA score before the procedure, and vital signs at the start of the procedure

	Total (n=198)	Group I (n=103)	Group II (n=95)	p-value
Age, median (range),	59 (18-84)	53 (19-84)	52 (18-82)	0.763*
Sex, n (%)				0.923**
Female	107 (54.0%)	56 (54.5%)	51 (53.7%)	
Male	91 (46.0%)	47 (45.6%)	44 (46.3%)	
BMI, mean (range) kg/m^2	26.60 (20.10-40.40)	26.70 (20.10-40.40)	26.40 (20.30-36.60)	0.998*
ASA score, n (%)				0.940**
ASA1	32 (16.2%)	17 (16.5%)	15 (15.8%)	
ASA2	112 (56.6%)	59 (57.3%)	53 (55.8%)	
ASA3	54 (27.3%)	27 (26.2%)	27 (28.4%)	
Systolic blood pressure, median (range), mmHg	126 (82-184)	125 (95-184)	130 (82-178)	0.575*
Diastolic blood pressure, median (range), mmHg	75.50 (40-127)	75 (40-127)	76 (50-118)	0.745*
Pulse, median (range)	86.50 (56-134)	86 (56-134)	87 (62-128)	0.661*
Saturation, median (range)	97 (68-110)	97 (68-110)	97 (87-100)	0.706*

*Mann-Whitney U test, **Chi-square test, n: Number, kg: Kilograms, m^2: Square meter, BMI: Body mass index, ASA: American Society of Anesthesiologists

any patient (Table 3). The contentment of our experienced endoscopists who conducted the procedures was also called into question. The average satisfaction rating of the endoscopists was 8.40±1.19. In group I, the average satisfaction for endoscopists was 8.66±1.00, whereas in group II, it was 8.12±1.31 (p=0.001). When assessing patient satisfaction, the mean score was 9.04±0.85 in group I and 8.84±1.29 in group II (p=0.183) (Table 3, Figure 2).

DISCUSSION

In this study, patients who underwent BDE in the same session were evaluated prospectively. However, the analysis was performed retrospectively. The retrospective analysis reduced the reliability of the study. Two different groups, group I and group II, were randomly assigned to patients who underwent BDE, and the patients were evaluated.

Figure 2. Endoscopist's and patient's satisfaction

Table 2. Processing times and variables during processing

	Total (n=198)	Group I (n=103)	Group II (n=95)	p-value
EGD duration, median (range),	3 (2-11)	4 (2-11)	3 (2-8)	0.173*
Colonoscopy duration, median (range),	10 (6-18)	10 (6-18)	10 (6-15)	0.428*
Prosedure duration, median (range), minute	17 (10-25)	17 (11-25)	17 (10-24)	0.808*
Transition period, median (range), min	3 (1-8)	3 (1-6)	3 (1-8)	**0.044***
Retching, n (%)				
Yes	73 (36.9%)	47 (45.6%)	26 (27.4%)	**0.008****
No	125 (63.1%)	56 (54.4%)	69 (72.6%)	
Ileocecal intubation rate, n (%)				
Yes	182 (91.9%)	95 (92.2%)	87 (91.6%)	0.866**
No	16 (8.1%)	8 (7.8%)	8 (8.4%)	
Additional anesthetic dose, n (%)				
Yes	119 (60.1%)	63 (61.2%)	56 (58.9%)	0.75**
No	79 (39.9%)	40 (38.8%)	39 (41.1%)	

*Mann-Whitney U test, **Chi-square test, EGD: Esophagogastroduodenoscopy, n: Number

Table 3. Esophagogastroduodenoscopy and colonoscopy complications, endoscopist and patient satisfaction

	Total (n=198)	Group I (n=103)	Group II (n=95)	p-value
Complications, n (%)				
Positive	6 (3.03%)	3 (2.91%)	3 (3.15%)	0.92**
Negative	192 (96.96%)	100 (97.08%)	92 (96.84%)	
Cardiopulmonary complications	2	1	1	
Lung infection, n	0	0	0	
Dental trauma, n	1	0	1	
Upper GI perforation (n)	0	0	0	
Lower GI perforation (n)	2	2	0	
Bleeding, n	1	0	1	
Endoscopist's satisfaction, mean±SD	8.40±1.19	8.66±1.00	8.12±1.31	**0.001***
Patient's satisfaction, mean±SD	8.94±1.08	9.04±0.85	8.84±1.29	0.183*

*Student's t-test, **Chi-square test, n: Number, GI: Gastrointestinal, SD: Standard deviation

The absence of differences in demographic data, BMI data, and vital signs obtained before the procedure between the study groups demonstrates the effectiveness of the randomization process. In previous studies, biases related to randomization were observed in studies related to BDE (6,11). BDE is performed routinely in endoscopy units, primarily for screening. BDE can be initiated using EGD or colonoscopy. Although there may be a priority order among the units, there are no prioritized recommendations in the literature. Studies have tended to focus more on changes related to sedation (12). In order to contribute to the literature, we aimed to compare which procedure should be performed first. We compared the procedure times, procedure success, anesthesia needs, patient satisfaction, and endoscopist satisfaction. With lower sedation doses, side effects such as delayed recovery or desaturation can be reduced. Park et al. (13) and Hao et al. (14) presented a related study. There was information in the literature stating the need for lower anesthesia doses when the EGD procedure was first performed in BDE. Choi et al. (6) stated that performing EGD first creates the need for lower-dose sedation. In our study, there was no significant difference in the need for additional dose anesthesia between the groups (p=0.75). In the Group that underwent EGD first, an additional 61.2% dose was needed. In the colonoscopy-first group, 58.9% needed an additional dose. Although there was no statistically significant difference. The need for additional dose was higher in the group that underwent EGD first. Colonoscopy is a more painful procedure for the patient (15,16). We posit that easier patient tolerance when EGD, which is a secondary procedure, is performed with adequate sedation during colonoscopy is effective in such situations. The need for additional doses decreased with the postponement of the less painful procedure. Sayın et al. (10) found no significant difference between gagging and the order of the procedure in their study. When gagging was evaluated, we found that it was more common in group I (p=0.08). We believe that the higher frequency of gagging was associated with EGD selected as the first procedure because of the effect of the endoscopist before the full effect of sedation was started. Although a statistically significant relationship exists, this should be supported by new studies. Gagging may be an endoscopist-dependent condition. Oner et al. (17) compared patients who only underwent colonoscopy, and underwent colonoscopy after EGD. They then compared the duration of colonoscopy between the two groups. After comparing the results, no statistically significant difference was found between groups. In our study, there was no significant difference between group I and group II in terms of colonoscopy time (p=0.428). Although the groups were not the same, we believe that the change in the procedure order did not change the duration of colonoscopy. We also found that the endoscopy time did not change with the procedure priority in our study (p=0.173). We believe that the main factor determining the procedure time is the endoscopist. Hsieh et al. (18) evaluated which procedure should be performed first. The results of their study found that there was no statistically significant change in EGD time. Colonoscopy and ileocecal intubation times with changes in procedure order. Similarly, in our study, there was no significant change in the related durations. However, we found a statistically significant difference in preparation time for procedures (p=0.044). We believe that the longer duration of this period in the group that primarily underwent colonoscopy was due to the fact that the cleaning of the procedure area due to colonoscopy and the change in protective materials of the patient and endoscopist were more. The complication rate of the entire study population was 3.03%. Complications were observed in three patients in group I and three patients in group II. There was no statistical relationship between the groups in terms of complications (p=0.92). When the complications were detailed, cardiopulmonary complications occurred in 2 patients, dental trauma in 1 patient, lower gastrointestinal perforation in 2 patients and bleeding in 1 patient. Pulmonary infection and upper gastrointestinal perforation were not observed in any patient. The literature has focused on anesthesia complications when evaluating changes in complications according to procedure order. Variations in procedure-related complications with procedure priority were not investigated. According to our study results, the complication status did not change according to procedure priority. More detailed multicenter studies with larger patient populations are needed. Patient and endoscopist satisfaction were evaluated according to procedure priority. There was no statistical significance between the two groups in terms of patient satisfaction. Patient satisfaction was significantly higher in the EGD group than in the non-EGD group. There was a statistically significant difference in endoscopist satisfaction between the groups (p=0.001), and higher satisfaction was reported among endoscopists in the EGD group. Sayın et al. (10) found that both endoscopists and patients reported higher satisfaction when colonoscopy was performed as the first procedure. On the other hand, Carter et al. (19) evaluated only patient satisfaction and found no statistically significant difference in patient satisfaction between the groups.

There are studies showing that nosocomial infections increase with colonoscopy (20,21). To prevent infection, it is important to pay attention to the necessary disinfection

and change of protective equipment. In this study, post-procedural complications were evaluated. Pulmonary infection was not observed in either group. We believe that infection can be prevented with adequate disinfection and replacement of protective equipment. There is a need for multicenter studies involving more endoscopists on this subject.

CONCLUSION

The number of BDEs is increasing with the widespread use of cancer screening. The question of whether EGD or colonoscopy should be performed first is thus raised. Although we endoscopists have a procedure priority according to their own thoughts, the literature does not clearly prioritize (in our center, the habit of performing EGD with priority is more prominent due to its ease in patient preparation). According to our study results, there was no apparent superiority between the procedures. The first two procedures can be performed first. Prospective multicenter studies with a high number of endoscopists are needed to provide definitive information.

ETHICS

Ethics Committee Approval: The Bandırma Onyedi Eylül University Rectorate Health Sciences Non-Interventional Research Ethics Board granted approval for the study on (date: 21/12/2023, decision no: 2023-184).

Informed Consent: Since this study was recorded retrospectively, patient consent was not required.

FOOTNOTES

Authorship Contributions

Sugical and Medical Practices: Y.F.A., M.Ö., A.H.Ö., Y.A., A.F.Ç., Concept: Y.F.A., M.Ö., S.O., Design: Y.F.A., M.Ö., S.O., Data Collection or Processing: Y.F.A., A.H.Ö., S.O.,Analysis or Interpretation: Y.F.A., A.H.Ö., Y.A., Literature Search: Y.F.A., M.Ö., A.H.Ö., Y.A., A.F.Ç., S.O., Writing: Y.F.A., M.Ö., A.F.Ç., S.O.

Conflict of Interest: No conflict of interest was declared by the authors.

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