Dicle Tıp Dergisi / Dicle Med J (2026) 53 (1) : 109-115

www.diclemedj.org

Original Article / Özgün Araştırma

Impact of Oral Contrast Ingestion Duration on Distal Colon and Rectum Opacification in Abdominal Computed Tomography

Atakan Küskün[1], Halis Harun Öztürk[1], M. Savaş Tepe[1], Burak Günay[2], Efehan Ulaş[3], Ömer Kostak[2]

1 Kırklareli University Faculty of Medicine, Department of Radiology, Kırklareli, Türkiye

2 Kırklareli Education and Research Hospital, Radiology Department, Kırklareli, Türkiye

3 Kırklareli Education and Research Hospital, Biostatistics and Medical Informatics Department, Kırklareli, Türkiye

Received: 12.08.2025; Revised: 17.02.2026; Accepted: 18.02.2026

Abstract

Objectives: Oncologic imaging, suspected intestinal leaks, fistulas, abscesses and collections, abdominal pain, and computed tomography colonography are the indications for the use of oral contrast media. The distal colon and rectum opacification is not always achieved with the standard technique in routine studies. Our aim is to compare the effect of 1.5-hour vs. 4-6-hour contrast media ingestion durations on distal colon and rectum opacification in abdominal computed tomography.

Methods: Adult patients in the year of 2023 were retrospectively grouped: those with a 4-6 hour contrast media ingestion duration (study group) and age- and sex-matched patients with a 1.5 hour contrast media ingestion duration (control group). After exclusions, there were 200 patients in total. Groups were evaluated for the association between contrast media ingestion durations and the most distal bowel segment opacified.

Results: Results showed a significant association between contrast material ingestion duration and the most distal opacified bowel segment ($p<0.001$). The contrast reached the rectum in 37% of the 1.5-hour group and 67% of the 4-6 hour group. Sex also affected opacification, with men having more distal bowel opacification ($p=0.017$).

Conclusions: Longer contrast media ingestion durations lead to almost 1.5-2 times more distal colon and rectum opacification, which could be adjusted based on suspected pathology location, though longer durations may reduce patient compliance.

Keywords: Computed Tomography, Abdomen, Oral contrast media, Bowel opacification

DOI: 10.5798/dicletip.1906461

Correspondence / Yazışma Adresi: *Atakan Küskün, Kırklareli University Faculty of Medicine, Department of Radiology, Türkiye e-mail: atakankuskun@klu.edu.tr*

Abdominal Bilgisayarlı Tomografi İncelemelerinde Oral Kontrast Madde İçme Süresinin Distal Kolon ve Rektum Opasifikasyonu Üzerindeki Etkisi

Öz

Amaç: Oral kontrast madde endikasyonları olarak, onkolojik görüntüleme, şüpheli bağırsak kaçakları, fistüller, abse ve koleksiyonlar, karın ağrısı ve bilgisayarlı tomografi (BT) kolonoskopi sayılabilir. Standart kontrast içme sürelerinde rutin tetkiklerde distal kolon ve rektum opaklaşması her zaman sağlanamamaktadır. Amacımız, abdominal BT'de 1,5 saatlik ve 4–6 saatlik kontrast madde içme süresinin distal kolon ve rektum opaklaşması üzerine etkisini değerlendirmektir.

Yöntemler: 2023 yılında oral kontrastlı abdomen BT'si olan yetişkin hastalar retrospektif, 4–6 saatlik (çalışma grubu) ve yaş-cinsiyet olarak eşleştirilmiş 1,5 saatlik (kontrol grubu) kontrast madde içme süresine sahip olanlar olarak iki gruba ayrıldı. Dışlama kriterleri uygulandıktan sonra toplamda 200 hasta kalmıştır. Gruplar, kontrast madde içme süreleri ile opaklaşan en distal bağırsak segmenti arasındaki ilişki yönünden değerlendirilmiştir.

Bulgular: Kontrast madde içme süresi ile opaklaşan en distal bağırsak segmenti arasında anlamlı bir ilişki bulundu (p<0,001). 1,5 saatlik grubun %37'sinde kontrast rektuma ulaşırken, 4–6 saatlik grubun %67'sinde ulaştı. Ayrıca, erkek hastalarda kontrast maddenin aynı sürede, daha distal bağırsağa ulaştığı (p=0,017) gözlendi.

Sonuç: Daha uzun kontrast madde içme süreleri, patolojinin şüphelenildiği bağırsak segmentine göre seçilerek yaklaşık 1,5–2 kat daha çok hastada distal kolon ve rektum opaklaşması elde edilebilir. Fakat uzun kontrast madde içme sürelerinin hasta uyumunu azaltabileceği göz önünde bulundurulmalıdır.

Anahtar kelimeler: Bilgisayarlı tomografi, abdomen, oral kontrast madde, bağırsak opasifikasyonu.

INTRODUCTION

In routine abdominal computed tomography (CT) scans, oral contrast media is necessary to evaluate the bowel, to detect colon tumors and polyps, to prevent the non-opacified bowel from mimicking a tumor, especially in thin patients (body mass index <25 kg/m2), and to differentiate mesenteric lymphadenopathies[1]. The American College of Radiology (ACR), in its updated 2024 ACR Manual on Contrast Media, lists oncologic imaging, suspected intestinal leaks, fistulas, abscesses and collections, abdominal pain, and CT colonography as the indications for the use of oral contrast media[2]. For routine abdominal CT scans, 500-1500 cc of diluted contrast medium is administered orally during 1-2 hours to achieve bowel opacification[3–5]. It is noteworthy that distal colon and rectum opacification is not always achieved with this technique in routine daily studies. However, studies on the effects of varying contrast ingestion durations for bowel opacification in CT scans are limited[4,6].

In our radiology department, unless otherwise stated, 50 cc of non-ionic iodinated contrast media diluted with 1500 cc of water is administered orally in 1.5 hours for routine daily abdominal CT scans when indicated. We have noticed that 1.5 hours is not sufficient for the opacification of the distal colon and rectum in most patients. In our hospital, two gastrointestinal surgeons have requested a 6-hour contrast media ingestion duration for their patients, especially for distal colon and rectum opacification, so only for these patients we changed our routine. In practice, patients who are scheduled for a 6-hour period usually have a 4-6 hour contrast media ingestion duration due to reasons such as the need for defecation. The fact that two different contrast administration durations in our practice gave us an opportunity to investigate the effect of these durations on bowel opacification, albeit retrospectively.

Our aim was to determine whether there is a difference between 1.5-hour versus 4-6-hour

contrast media ingestion durations in terms of distal colon and rectum opacification and to show how often rectal contrast opacification can be achieved in each. As a result, we believe that the optimal duration of oral contrast media administration can be determined, which can be modified according to CT indication.

METHODS

This study is executed in Kırklareli Training and Research Hospital after the approval of Kırklareli University Ethics Committee for Non-interventional Clinical Studies (30.01.2024 / P20240003-03) on adult patients. In Kırklareli Training and Research Hospital, there are two gastrointestinal surgeons who specifically request a 6-hour contrast media ingestion duration for their patients when oral contrast media is indicated. These patients with 6-hour contrast media ingestion duration comprised our study group. PACS was retrospectively scanned for these abdominal CT examinations and a total of 100 patients were found in 2023, in the 4-6-hour contrast media ingestion duration group which comprised the study group. Age- and sex-matched patients who had undergone routine oral contrast positive abdominal CT examinations with a 1.5-hour contrast ingestion duration in 2023 were found to comprise the control group.

Our exclusion criteria were:

- Any surgery effecting gastrointestinal tract length or continuity
- Obstructive pathologies (ileus, volvulus, etc.)
- Ileostomy, and colostomy

A radiologist with 3 years of experience, evaluated both the study and control groups for the exclusion criteria, blinded. After the exclusion process, both the study and control groups comprise a total of 200 patients. A radiologist with 20 years of experience, evaluated all the patients for the most distal bowel segment opacified, who is blinded to the contrast administration. We arbitrarily divided the gastrointestinal tract into 10 parts: 0. Stomach, 1. Duodenum, 2. Proximal Jejunum, 3. Distal Jejunum, 4. Proximal Ileum, 5. Distal Ileum, 6. Ascending Colon, 7. Transverse Colon, 8. Descending Colon, 9. Sigmoid Colon, 10. Rectum. We considered the contrast media reached the bowel segment when contrast was observed in the proximal part of that segment (Figure 1a-d).

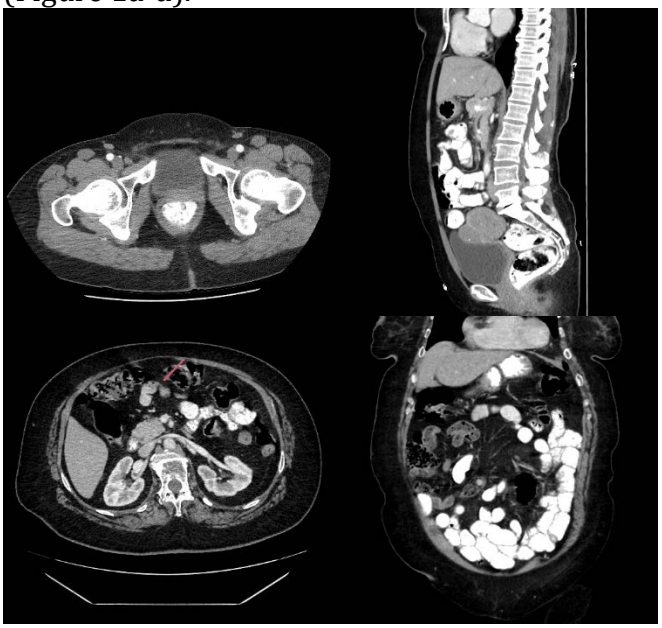

Figure 1a-b. shows contrast media reached rectum (**a**), and whole small and large bowels are opacified (**b**) in a patient with 4-6-hour ingestion duration; in (**c**) contrast media reached jejunum, and in the same patient proksimal ileum (**d**) and small intestine and stomach are opacified with 1,5-hour ingestion duration.

CT scans of all patients were performed on a General Electric Healthcare Revolution 128-channels multislice CT (General Electric Healthcare, USA). Scanning parameters were as follows: 1.25mm slice thickness, 120 kVp, 99-398 mA x-ray tube current, 28.7-37.8 cm reconstruction diameter.

Statistics

All the data analyzed for the relationship between age and sex and the most distal bowel segment opacified. The correlation matrix analysis was applied for testing the association

between age and the most distal bowel segment opacified; the chi-square test was applied for testing the association between sex and the most distal bowel segment opacified. The study and control groups are evaluated for the association between contrast media ingestion durations and the most distal bowel segment opacified with the Mann-Whitney U test. The statistical analysis was performed by using R software (version 4.4, The R Foundation for Statistical Computing, Austria).

RESULTS

There were 100 patients, 42 males and 58 females, in each of the study and control groups. The mean age of the study group was 60.2 ± 14.1 years; the mean age of the control group was 60.2 ± 14.7 years (Table I).

Table I: Age distribution of both control and study groups.

	Age				
Contrast Ingestion Duration	N	Mean	SD	Minimum	Maximum
1,5 hour	100	60.2	14.7	23	89
4-6 hour	100	60.2	14.1	22	89

For the relationship between contrast media ingestion duration and the most distal opacified bowel segment, the Mann-Whitney U test is applied, and a p-value of <0.001 was calculated. In the control group, the most distal opacified bowel segment median value was 9 (sigmoid colon), while in the study group it was 10 (rectum) (Table II and Figure 2). In the 4-6 hour group for all the patients, contrast media reached the colon, whereas in the 1.5 hour group the contrast media reached the colon in 95% of the patients. When we consider the rectum, percentages were 67 and 37, respectively (Table III).

Table II: shows the distribution of the most distal bowel segment opacified data according to contrast media ingestion duration

	Distal Bowel Segment				
Contrast Ingestion Duration	N	Median	SD	Minimum	Maximum
1,5 hour	100	9.00	1.474	4	10
4-6 hour	100	10.00	0.994	6	10

Table III: shows frequencies of the most distal bowel segment opacified according to contrast media ingestion durations

	Distal Bowel Segment							
Contrast Ingestion Duration	10 Rectum	9 Sigmoid Colon	8 Descending Colon	7 Transverse Colon	6 Ascending Colon	5 Distal Ileum	4 Proximal Ileum	Total
1,5 hour	37	16	22	18	2	4	1	100
	37.0%	16.0%	22.0%	18.0%	2.0%	4.0%	1.0%	100.0%
4-6 hour	67	13	13	6	1	0	0	100
	67.0%	13.0%	13.0%	6.0%	1.0%	0.0%	0.0%	100.0%
Total	104	29	35	24	3	4	1	200
	52.0%	14.5%	17.5%	12.0%	1.5%	2.0%	0.5%	100.0%

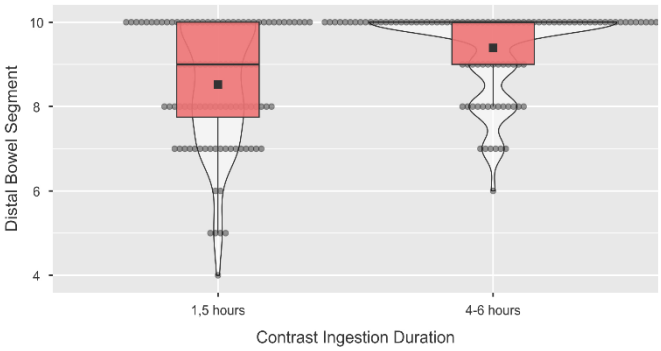

Figure 2. shows the density and distribution of the most distal bowel segment opacified data according to contrast media ingestion duration. While the black square depicts the mean value, the short horizontal black line depicts the median value.

The Chi-square test for sex and the most distal opacified bowel segment revealed a significant association, with a Chi-square value of 15.48 and a p-value of 0.017. For males, the most distal bowel segment opacified median value was 10 (rectum), and for females, it was 9 (sigmoid colon). In the male group, 60.7% of contrast media reached the rectum, and in the female group, this value was 45.7% (Figure 3).

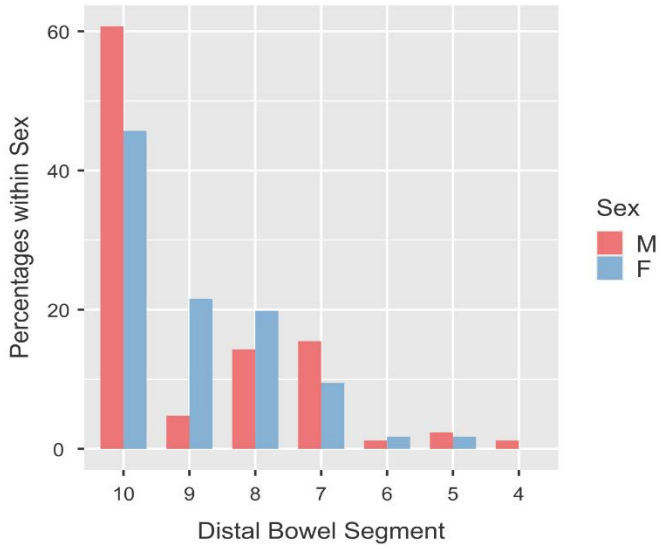

Figure 3. shows the distribution of the most distal bowel segment opacified data according to sex

The correlation matrix analysis was performed to investigate whether there was a significant difference between age and the most distal bowel segment opacified. The test yielded a Spearman's rho of -0.087 and a p-value of 0.110, indicating no significant relationship.

DISCUSSION

There are studies on oral contrast media investigating whether it is really necessary or not in abdominal CT examinations; the effect of oral contrast on emergency department length of stay; the advantages of negative, neutral, and positive contrast media; which molecule is more successful among positive contrast media; and at which concentrations positive contrast media should be used[1,5,7–12]. However, studies on the effect of the contrast media ingestion durations on the progression of contrast media in the bowel are limited. In a study conducted in adults in 2016, Hanna et al. reported that 51% of the contrast media reached the terminal ileum and 16% reached the distal colon one hour after ingestion. In the remaining 49%, the contrast media ends up in the more proximal intestine[4]. Laituri et al. reported the rate of reaching the terminal ileum as 72.4% after an average of 105 minutes of contrast media ingestion duration in the pediatric age group in 2011[11]. Herbert et al. in their studies in 40 adults found the rate of contrast media reaching the colon as 45% after 2-2.[5] hours, which is slower than previous studies[13]. In this study, the rate of contrast media reaching the colon is much higher than in previous studies. It was 95% in the 1.5-hour group and 100% in the 4-6 hour group. If we consider the rectum, the rate was 37% in the 1.5-hour group and 67% in the 4-6 hour group. In an oral presentation with a total of 100 patients in April 2023, the rate of contrast media reaching the rectum was found to be 14.8% in the 1.5-hour group and 77.8% in the 6-hour group[6]. These discrepancies may be due to the male/female ratios of the samples in the studies and varying gastrointestinal motilities of the participants included in the samples. Figure 1 shows that when the contrast ingestion duration increases to 4-6 hours, the percentage of contrast media reaching the

rectum increases, the median value increases by one step compared to the 1.5-hour group, and the distribution of contrast media is concentrated in the distal colon and rectum.

When we evaluated both groups together in terms of sex, we found that the contrast media reaches more distally in men. It is noteworthy that sex affects the most distal bowel segment opacified, independent from the contrast media ingestion duration. Buhmann et al. have also found in their study that mean colonic transit time was lower (31±10 h vs. 41±9 h) in men than in women[14]. However, we found no such relationship between age groups and the most distal bowel segment opacified.

This study has some limitations, such as being retrospective and not recording the contrast ingestion durations firsthand. A prospective study in which the contrast media ingestion durations are noted prior to the CT scan may be more reliable. Also, recording participants' defecation frequencies, which indicates intestinal motilities, and comparing them with the most distal bowel segment opacified would be elucidative.

CONCLUSION

The results show that increasing the ingestion duration from 1.5 hours to 4-6 hours increases the rectum opacification by almost two times. Thus, the contrast ingestion duration can be modified according to the possible localization of the pathology in the gastrointestinal tract in the preliminary diagnosis of the patient, and unnecessary repeat imaging and rectal contrast administration can be avoided. However, 4-6 hours can be too long for a CT scan and may reduce patient compliance. It is also noteworthy that the routine 1.5-hour method can provide distal colon and rectum contrast in half of the patients. Since the literature is partial regarding the effect of different contrast ingestion durations on colon opacification, this study may be suggestive as well for neutral and negative contrast agents used in CT and oral contrast agents used in MRI.

Ethical Approval: This study is executed in Kırklareli Training and Research Hospital after the approval of Kırklareli University Ethics Committee for Non-interventional Clinical Studies (30.01.2024 / P20240003-03) on adult patients.

Conflict of Interest: The authors declared no conflicts of interest.

Financial Disclosure: The authors declared that this study has receivet no financial support.

REFERENCES

1. Basile J, Kenny JF, Khodorkovsky B, et al. Effects of eliminating routine use of oral contrast for computed tomography of the abdomen and pelvis: A pilot study. Clin Imaging 2018; 49: 159–62.

2. ACR Manual on Contrast Media [Internet]. American College of Radiology; 2024. Available from: https://www.acr.org/-/media/ACR/Files/Clinical-Resources/Contrast_Media.pdf

3. Friedrich JM, Skinningsrud K, Welter C, Eide H, Merkle E. Oral administration of iopentol (Imagopaque 300 mg I/ml) compared with amidotrizoate (Peritrast 300 mg I/ml), both diluted to 2% (v/v), in imaging of the gastrointestinal tract in abdominal contrast enhanced CT. A clinical trial assessing patient tolerance, distribution of contrast medium and Hounsfield unit measurements. Eur Radiol 1997; 7 Suppl 4: 140-4.

4. Hanna TN, Streicher DA, Razavi SA, et al. Enteric Distribution of Oral Contrast in Emergency Department Patients Undergoing Abdominal-Pelvic Computed Tomography. Can Assoc Radiol J 2016; 67(3): 204–11.

5. Kielar A, Macdonald B, Krishna S. Use of Oral Contrast in Abdominal/Pelvic CT Scans. Can Assoc Radiol J 2021; 72(3): 339–40.

6. Kostak Ö. Abdomen Bilgisayarlı Tomografilerinde Oral Kontrast Madde İçme Süresinin Kalın Bağırsak Kontrast Dolumuna Etkisi [Internet]. 17. Ulusal Radyoteknoloji Kongresi ve Eğitim Seminerleri; 2023 Apr 27. Available from:

http://www.tmrtder.org.tr/2023/docs/bildiri.pdf?a=7485

7. Triche BL, Annamalai A, Pooler BD, et al. Positive oral contrast material for CT evaluation of non-traumatic abdominal pain in the ED: prospective assessment of diagnostic confidence and throughput metrics. Abdom Radiol 2022; 47(8): 2956–67.

8. Pickhardt PJ. Positive Oral Contrast Material for Abdominal CT: Current Clinical Indications and Areas of Controversy. AJR Am J Roentgenol 2020; 215(1): 69–78.

9. Kessner R, Barnes S, Halpern P, Makrin V, Blachar A. CT for Acute Nontraumatic Abdominal Pain—Is Oral Contrast Really Required? Academic Radiology 2017; 24(7): 840–5.

10. Yu Q, Liu J. The diagnostic value of contrast-enhanced computed tomography imaging for detection of colorectal tumors: A meta-analysis. J Cancer Res Ther 2016; 12(Supplement): C241–3.

11. Laituri CA, Fraser JD, Aguayo P, et al. The Lack of Efficacy for Oral Contrast in the Diagnosis of Appendicitis by Computed Tomography. Journal of Surgical Research 2011; 170(1): 100–3.

12. Schuur JD, Chu G, Sucov A. Effect of oral contrast for abdominal computed tomography on emergency department length of stay. Emerg Radiol 2010; 17(4): 267–73.

13. Hebert JJ, Taylor AJ, Winter TC. Comparison of colonic transit between polyethylene glycol and water as oral contrast vehicles in the CT evaluation of acute appendicitis. AJR Am J Roentgenol 2006; 187(5): 1188–91.

14. Buhmann S, Kirchhoff C, Ladurner R, et al. Assessment of colonic transit time using MRI: a feasibility study. Eur Radiol 2007; 17(3): 669–74.