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Analysis of the effectiveness of abdominal contrast-enhanced computed tomography in evaluating the degree of gastric dilatation

Q. Jing[1,2], L. Zhao[1,2*], R. Yang[2,3], N. Hu[1], D. Wu[1,2], Z. Zhang[1,2], K. Qiu[1,2], X. Zhong[1,2]

[1]*Department of Radiology, West China Hospital, Sichuan University, Chengdu, Sichuan, China*
[2]*West China School of Nursing, Sichuan University, Chengdu, Sichuan, China*
[3]*Department of Neurology, West China Hospital, Sichuan University, Chengdu, Sichuan, China*

► ***Original article***

***Corresponding author:**
Lihong Zhao, M.D.,
E-mail:
zhaolihong741256@163.com

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ABSTRACT

Background: To assess the degree of gastric dilatation in patients undergoing abdominal contrast-enhanced computer tomography (CT) and to identify factors associated with gastric dilatation. ***Materials and Methods:*** This study adopted a cross-sectional design. Participants ingested water to distend the stomach 10 minutes prior to CT examination. After baseline assessment, participants self-administered the STAI under research assistant supervision. The degree of gastric dilation positively correlated with image clarity score (scale 1~5). Ordinal logistic regression analysis was used to identify influencing factors. ***Results:*** A gastric dilation score of 5 (indicating maximal dilation) was recorded in 14.0% of case, with median oral contrast volume reaching 1000ml. Ordinal logistic regression analysis confirmed five independent predictors of gastric dilation quality: education (OR=1.534, 95%CI=1.056-5.138, P=0.008), BMI（OR=4.025, 95%CI=2.284-7-092, P<0.001, water intake (OR=13.317, 95% CI 5.681-11.565, P<0.001), fasting status (OR=1.544, 95%CI=1.323-1.916, P=0.022) and ethnicity (OR=1.679, 95%CI=1.311-1.916, P=0.023). Inter-reader agreement was excellent (ICC=0.943). ***Conclusions:*** In individuals who underwent abdominal contrast-enhanced CT, the general state of stomach filling was poor. The education level, dietary intake, the consumed amount of water, BMI and ethnicity contributed to gastric dilatation.

INTRODUCTION

Gastric disease are highly prevalent in East Asia, notably, gastric cancer ranks as the third most common cause of cancer-related mortality globally [1-3]. In China, more than 80% of cases are diagnosed at advanced stages [4, 5]. To enhance early disease diagnosis, the Chinses government has implemented comprehensive initiatives to reduce the associated disease burden [6].

Precise staging of gastric disease is essential to guide optimal therapy selection [7]. As cavity organ, the stomach is composed of the muscularis propria, the middle layer of smooth muscle, and a submucosa [8]. If inadequate gastric dilatation happens, it will cause cavity organ missed lesions before multi-detector row CT screening [9, 10]. Optimal gastric distension achieved through pre-CT oral ingestion of air and/or water ensures imaging quality while facilitating multiplanar reconstruction-based detection of architectural abnormalities in the gastric wall [11, 12]. And, with adequate dilatation of the gastric by using water as negative contrast, dynamic contrast-enhanced CT images offer superior differentiation of tumor tissue from normal mucosa [13]. Advancements in multi-detector CT technology enhance pathological staging accuracy, inform treatment strategies, optimize clinical follow-up, and support comprehensive management of gastric diseases. Consequently, water was selected as the gastric dilatation agent in this study [14, 15]. However, the dearth of research evaluating pre-CT preparation variables impedes the creation of validated patient education modules for optimizing scan quality.

This descriptive cross-sectional study quantified pre-procedural gastric distension and its determinants in gastric disease patients undergoing abdominal contrast-enhanced CT, aiming to optimize imaging protocols. This research seeks to enhance CT preparation education for gastric disease patients undergoing contrast-enhanced examinations. These results suggest actionable pathways to advance evidence-based radiology nursing practice.

MATERIALS AND METHODS

Patient population

This study was implemented in West China

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Hospital. From March 2020 to December 2020, 339 consecutive patients who underwent follow-up abdominal contrast-enhanced multi-detector row CT screening were chosen. The enrolled patients were required to meet the inclusion criteria as follows: (1) Participants were required to be over 18 years of age with no history of gastric surgery; (2) Following the principle of informed consent; (3) Be conscious while participating in the study and communicate clearly and correctly. The exclusion criteria included: (4) Patients who were fasting and water-deprived were not allowed; (2) Patients who were lactating or were suffering from cardiac insufficiency (heart function II, III, or IV, or NYHA) [16]; (3) Eliminating the patient or family members requested withdrawal; (4) Patients could not complete CT screening. Based on above criteria, 3 participants dropped out of the study (2 patients thought that without benefit, 1 patient vomited), 336 patients were included.

The study received approval from the ethics committee West China Hospital (Approval No.: 2020-1289), and each patient signed a written informed consent form.

Patient preparation and positioning

After completing the venipuncture (20G, BD InsyteTM Intravenous Catheters, USA), patients made their way to the CT room. Then the nurse gave each patient a graduated cup and instructed them to drink water 10 minutes before to the CT scan. The patient reported their water intake to the nurse, who recorded it. As previously described [17], the patients completed the assessment of State-Trait Anxiety Inventory that included State-Trait Anxiety Inventory I with 20 items with a 4-level scale at the same time when the collector was explaining the State Anxiety Inventory.

CT acquisition

Contrast-enhanced multi-detector row CT was performed with a Revolution CT scanner (GE Healthcare, Revolution, USA). With patients in the supine position, both upper limbs were raised and crossed on the CT table [18]. 370mg/ml of the nonionic iodine contrast agents Iopromide (Ultravist, Byer, Germany) were warmed to 37°C, then it was injected using a power injector Medrad (Byer, Germany) at a rate of 2.5 ml/s~3 ml/s. The abdominal aorta was designated as the region of interest, and the attenuation values with the region of interest were monitored, until a predefined enhancement threshold of 190 HU was reached, triggering the scan. The CT parameters used were as follows: pitch 0.992:1; kvp/mA, 120/450; ASIR-V: 50%; window width 300; window level 45; reconstruction slice thickness 5 mm.

Image evaluation

The study's primary goal was admired to gastric dilatation via measuring the gastric contour, the thickness of the gastric wall, the greater curvature of the stomach, and the lesser curvature of the stomach. The visual grading characteristics were utilized to analyze the visual grading of gastric dilatation imaging [19]. The scale of evaluation was an follows [20-22]: (1) 5 points: The gastric curvature profile is regular, the gastric wall is uniform (no more than 3 mm),the gastric margins of the lesser and greater curvature were neater and smoother without folds, the image was easier to diagnose. (2) 4 points: The outline of the gastric was regular, the gastric wall was relatively uniform and no more than 3 mm, the gastric rims of the lesser and greater curvature were neat and smooth, the image was easy to detect. (3) 3 points: the stomach contour profile is slightly regular, the gastric wall was reasonably uniform, the thickness is 3 mm~5 mm, the edges of the lesser curvature and the greater curvature of the stomach were tidy with creases, and the image was difficult to diagnose. (4) 2 scores: The stomach shape was slightly regular, the gastric wall is uneven, the thickness is 3 mm~5 mm, the lesser curvature and lager curvature of the stomach were irregular with folds, and it's more difficult to detect. (5) 1 scores: The gastric contour was uneven, the thickness of the gastric wall was greater than 5 mm, the margins of the lesser curvature and the greater curvature were apparent, and the image was extremely difficult to diagnose. All in all, the higher the score, the better the stomach dilatation. Two radiologists with 5 years of expertise in abdominal diagnosis were recruited independently and blindly evaluated the image of stomach bloating. If there were differences between the two doctors, a third radiologist evaluated the image to determine the final score.

Consistency between the two radiologists was a secondary outcome. The intraclass correlation coefficient [23, 24] was the variation between two radiologists belonging to the same topic category.

The adverse events

As per the guideline, the adverse reactions were categorized as mild, moderate, or severe. Limited nausea/vomiting, anxiety, headache were mild signs and symptoms were self-limited without evidence of progression. Prolonged nausea and/or vomiting, facial edema without dyspnea, and other symptoms were considered moderate responses. Severe side effects included diffuse edema, facial edema with dyspnea, arrhythmia, a vasovagal reaction refractory to therapy, etc.

Statistical analysis

Statistical analysis was performed using SPSS 23.0 software. Count data were recorded as [n (%)] and compared using the chi-square test. Measurement data were confirmed for distribution using the Shapiro-wilk test, normally distributed data were

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recorded as (c±s), compared using the independent samples t test, comparisons between multiple groups were made using analysis of variance for repeated measures and the LSD within-group test, and correlations were analyzed using the Pearson correlation coefficient analysis; non-normally distributed data were recorded as [median (interquartile spacing)], and comparisons were made using the nonparametric Mann-Whitney U test, comparisons between multiple groups were made using the Kruskal-Wallis H test, and correlations were analyzed using Spearman's correlation coefficient. Correlations were analyzed using logistic regression. differences were considered statistically significant at $P<0.05$.

RESULTS

Patient demographic

Among 336 patients, the demographic data were shown in table 1. There were 152 males (45.2%) and 184 females (54.8%). The average age was 52.93±12.48 years old (18 to 82 years old). The median and quartile Body Mass Index (BMI) was 22.70kg/m^2 (20.85 kg/m^2, 24.93 kg/m^2), the median and quartile waist hip ratio was 0.90 (0.86, 0.94), the median and quartile water dosage was 400 ml (400 ml, 600 ml), and the median and quartile SAI was 42 (41, 47).

Gastric dilatation

Table 1. Demographic characteristics of 336 participants.

Variable	Number (n, %)	Variable	Number (n, %)
Age		**Patient source**	
18~64 years	270 (80.4 %)	Outpatient department	304 (90.5 %)
≥65 years	66 (19.6 %)	Inpatient department	32 (9.5 %)
Gender		**The number of enhanced-contrast CT**	
Male	152 (45.2 %)	First visit	110 (32.7 %)
Female	184 (54.8 %)	Subsequent visit	226 (67.3 %)
Ethnicity		**Diagnosis**	
Han nationality	326 (97.0 %)	Tumor	228 (67.9 %)
minority	10 (3.0 %)	Non-tumor	108 (32.1 %)
Food consumption		**Educational level**	
ate	134 (39.9 %)	Elementary school or less	50 (14.9 %)
fasting	202 (60.1 %)	Middle school	107 (31.8 %)
BMI		Senior school	64 (19.1 %)
< 18.5 kg/m^2	24 (7.1 %)	College and above	115 (34.2 %)
18.5~23.9 kg/m^2	192 (57.1 %)	**State-Trait Anxiety Inventory**	
24~27.9 kg/m^2	104 (31.0 %)	< 51	304 (90.5 %)
≥28 kg/m^2	16 (4.8 %)	≥51	32 (9.5 %)
Water dosage		**Waist Hip Ration**	
< 500 ml	113 (33.6 %)	Female ≥ 0.85, male ≥ 0.9	236 (70.2 %)
500~800 ml	180 (53.6 %)	Female < 0.85, male < 0.9	100 (29.8 %)
> 800 ml	43 (12.8 %)		

There were 24(7.1%) images that got 1 point, 56 (16.7%) that received 2 points, 117(34.8%) images that calculated as 3 points, 92(27.4%) images that scored 4 points, and 47(14.0%) images with 5 points. It was 139 individuals (41.4%) more than 4 points. The representative radiological images of patients with 1 score, 2 scores and 5 scores were presented in figure 1.

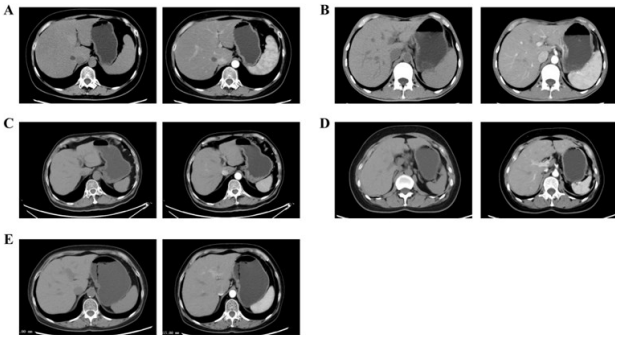

Figure 1. CT plain images of some patients before and after the use of contrast agents. **(A)** Female, 57 years old, neuroendocrine tumor. **(B)** Male, 41 years old, outpatient, nasopharyngeal carcinoma malignant tumor. **(C)** Male, 70 years old, malignant tumor of descending colon. **(D)** Female, 55 years old, lung cancer of the upper lobe of the left lung. **(E)** F, 63 y/o, malignant tumor of rectum.

The adverse reactions

18 participants had adverse effects, notably nausea or a feeling of fullness. Five instances (1.5%) happened in the group where the water dose was less than 500 ml, seven cases (2.1%) happened in the group where it was between 500 and 800 ml, and six patients (1.8%) had symptoms in the group where it was beyond 800ml.

Each variable used in the investigation of gastric dilatation

It was found that age, sex, education levels, and other variables were not statistically significant ($P>0.05$) under different scores of gastric dilatations. Food consumption ($\chi^2=16.802$, $P<0.05$), BMI ($H=11.738$, $P<0.001$), water dosage ($H=110.022$, $P<0.001$), and state-trait anxiety scale ($H=9.011$, $P<0.001$) all had statistically significant effects, as shown in table 2.

Correlation of each variable with gastric dilatation

There was no relationship between stomach dilatation and ethnicity, patient source, educational level, or the quantity of contrast-enhanced multi-detector row CT images ($P > 0.05$). The correlations of age ($r=-0.122$, $P<0.05$), sex ($r=0.131$, $P<0.05$), body mass index ($r=-0.128$, $P<0.05$), waist hip ratio ($r=-0.108$, $P<0.05$), state-trait anxiety inventory ($r=0.157$, $P<0.05$), and dietary intake ($r=-0.196$, $P<0.05$) with gastric dilatation were weak. Gastric dilatation and the volume of water had a modestly positive correlation ($r = 0.521$, $P < 0.001$) (table 3).

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Table 2. The statistical results of each variable.

variables	The gastric dilatation score（N=336）					χ^2, H or F	P
	1	2	3	4	5		
Age, years	55.42 ± 12.47	54.96 ± 12.71	53.45 ± 11.88	51.62 ± 13.14	50.47 ± 12.16	1.378[a]	0.241
Gender						6.440[b]	0.169
Males	12 (7.9 %)	30 (19.7 %)	58 (38.2 %)	36 (23.7 %)	16 (10.5 %)		
Females	12 (6.5 %)	26 (14.1 %)	59 (32.1 %)	56 (30.4 %)	31 (16.8 %)		
Ethnicity						4.893[b]	0.298
Han nationality	23 (7.1%)	55(16.9 %)	114 (35.0 %)	87 (26.7 %)	47 (14.4 %)		
Minority	1 (10.0 %)	1(10.0 %)	3 (30.0 %)	5 (50.0 %)	0 (0.0 %)		
Educational level						7.956[b]	0.789
Elementary school or less	4 (8.0 %)	8 (16.0 %)	21 (42.0 %)	13 (26.0 %)	4 (8.0 %)		
Middle school	10 (9.3 %)	15 (14.0 %)	38 (35.5 %)	31 (29.0 %)	13 (12.1 %)		
Senior school	5 (7.8 %)	14 (21.9 %)	19 (29.7 %)	15 (23.4 %)	11 (17.2 %)		
College and above	5 (4.3 %)	19 (16.5 %)	39 (33.9 %)	33 (28.7 %)	19 (16.5 %)		
Patient Source						5.697[b]	0.223
Outpatient department	5 (15.6 %)	5 (15.6 %)	9 (28.1 %)	6 (18.8 %)	7 (21.9 %)		
Inpatient department	19 (6.3 %)	51 (16.8 %)	108 (35.5 %)	86 (28.3 %)	40 (13.2 %)		
Diagnosis						3.960[b]	0.412
Tumor	15 (6.6 %)	43 (18.9 %)	76 (33.3 %)	65 (28.5 %)	29 (12.7 %)		
Non-tumor	9 (8.3 %)	13 (12.0 %)	41 (38.0 %)	27 (25.0 %)	18 (16.7 %)		
Food consumption						16.802[b]	< 0.001
Fasting	12 (5.9%)	28 (13.9 %)	65 (32.2 %)	57 (28.2 %)	40 (19.8 %)		
Ate	12 (9.0%)	28 (20.9 %)	52 (38.8 %)	35 (26.1 %)	7 (5.2 %)		
The visit number of enhanced -contrast CT						1.936[b]	0.747
First visit	8 (7.3 %)	17 (15.5 %)	34 (30.9 %)	33 (30.0 %)	18 (16.4 %)		
Subsequent visit	16 (7.1 %)	39 (17.3 %)	83 (36.7 %)	59 (26.1 %)	29 (12.8 %)		
BMI (kg / m^2)	22.04 (20.79, 26.15)	24.07 (21.72, 26.44)	22.52 (20.53, 24.66)	22.72 (21.64, 24.55)	21.64 (20.08, 23.88)	11.739[c]	0.019
Waist Hip Ration	0.92 (0.89, 0.96)	0.89 (0.86, 0.94)	0.9 (0.87, 0.93)	0.9 (0.85, 0.93)	0.88 (0.85, 0.92)	6.089[c]	0.193
State-Trait Anxiety Inventory	39.5 (29.25, 46)	38.5 (30.5, 46)	42 (34, 46.5)	43 (39, 47)	42 (40, 47)	9.611[c]	0.048
The volume of water (ml)	400 (275, 500)	400 (300, 500)	500 (400, 500)	500 (500, 600)	1000 (800, 1000)	110.022[c]	<0.001

Note: a, F value; b, χ2 value; c, H value, Body Mass Index (BMI).

Table 3. The correlation of each variable with gastric dilatation.

variables	*r*	*P*
Age	-0.122	0.025
Gender	0.131	0.016
Ethnicity	0.003	0.960
Patient source	0.018	0.745
Educational level	0.074	0.174
BMI	-0.128	0.019
Waist Hip Ration	-0.108	0.047
The number of contrast-enhanced CT	-0.058	0.290
Food consumption	-0.196	<0.001
The volume of water	0.521	<0.001
State-Trait Anxiety Inventory	0.157	0.004

Note: Body Mass Index (BMI).

Analysis of factors with gastric dilatation using ordinal logistic regression

Preferably, we assigned values to all variables (table 4) and performed binary logistic regression analysis as covariates with gastric dilatation as the dependent variable. The results showed that educational attainment (OR=1.534, 95%CI=1.056-5.138, P=0.008), water intake volume (OR=13.317, 95%CI=5.681-11.565, P<0.001), BMI (OR=4.025, 95%CI=2.24-7.092, P<0.001) and food intake status (OR=1.544, 95%CI=1.323-1.916, P<0.001) were statistically significant (Table 5). This suggests that factors such as education level, water intake volume and fasting status significantly affect stomach dilation.

Table 4. Table of assignments.

Variable	Assignments
Gastric dilatation	1-3 points=1, 4-5 points=2
Age	Analysis using raw data
Ethnicity	Minority=1, Han=2
Gender	Female=1, Male=2
Patient source	Inpatient=1, Outpatient=2
Education level	Elementary or less=1, Middle school=2, Senior school=3, College and above=4
BMI	Analysis using raw data
Waist Hip Ration	Analysis using raw data
Diagnosis	Non-tumor=1, Tumor=2
Water intake	<500 mL=1, 500-800mL=2, >800mL=3
Food intake	Fasting=1, Ate=2

Note: Body Mass Index (BMI).

Table 5. Ordinal logistic regression of variables with gastric dilatation.

Variable	Beta (logOR)	SE	Wals	p-value	OR	95% CI
Age	-0.006	0.011	0.292	0.589	0.994	0.973-1.016
Ethnicity	6.986	0.726	5.189	0.023	1.679	1.311-1.916
Gender	-0.627	0.275	1.826	0.177	0.846	0.641-11.193
Patient source	-0.006	0.457	0.000	0.989	0.994	0.406-2.434
Education level	0.625	1.154	12.293	0.008	1.534	1.056-5.138
BMI	1.392	0.289	23.199	<0.001	4.025	2.284-7.092
Waist Hip Ration	-1.260	1.875	0.452	0.501	0.284	0.007-2.055
Diagnosis	0.180	0.276	0.425	0.515	1.197	0.697-2.055
Water intake	2.589	0.440	34.575	<0.001	13.317	5.681-11.565
Food intake	0.610	0.266	5.249	0.022	1.544	1.323-1.916

Note: Body Mass Index (BMI).

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Comparison of groups using pairwise comparisons

The other groups of stomach dilatation were statistically significant when the group scoring 5 points (table 6). With a median water consumption of 1000 ml and quartiles of 800 ml and 1000 ml, respectively, the gastric dilatation score was 5 points. The average was 925.53±218.16 ml.

Table 6. The pairwise comparisons.

Contrast (I-J)	Mean difference	p-value	95% CI
1-2	-92.2	0.050	[-184.27, -0.13]
1-3	-115.8	0.007	[-200.38, -31.22]
1-4	-205.8	<0.001	[-292.35, -119.25]
1-5	-567.2	<0.001	[-661.88, -472.52]
2-3	-23.6	0.450	[-84.94, 37.74]
2-4	-113.6	0.001	[-177.54, -49.66]
2-5	-475.0	<0.001	[-549.75, -400.25]
3-4	-90.0	0.001	[-142.53, -37.47]
3-5	-451.4	<0.001	[-516.64, -386.16]
4-5	-361.4	<0.001	[-429.05, -293.75]

Note: Gastric dilatation scored 1 point, and the average dose of water intake was 358.33 ml; scored 2 points, the average dose of water intake was 450.536 ml; scored 3 points, and the average dose of water intake was 474.103 ml; scored 4 points, and the average dose of water intake was 564.130 ml; scored 5 points, and the average dose of water intake was 925.532 ml.

The two radiologists' consistency

The ICC was 0.943(95% CI 0.930 to 0.954, *P*<0.001). The two radiologists' results were extremely consistent, and the assessment results of the evaluation were highly reliable.

DISCUSSION

The guidelines for CT image quality suggest that patient oral contrast media is a way of improving CT quality before CT screening [25]. Therefore, patient preparation is essential prior to CT screening. Currently, hardware and software advancements are improving CT image quality. However, few evidence reported that the association between water dosage and gastric dilatation degree. The volume of the adult gastric cavity is 1.5 L to 2 L [26]. Yet, this investigation found that some patients' preparation for gastric filling prior to abdominal contrast-enhanced multi-detector row CT was insufficient. The proportion of patients attaining a 5-point score with gastric filling was notably low at 14%. When the score was 5 points, the median volume of water consumed was 1000 ml, with the quartiles being 800 ml and 1000 ml. Nevertheless, before to CT scanning, roughly 33.6% of patients consumed less than 500ml of water. A part of patient gastric dilatation would seem to be inadequately prepared for the investigation. Preliminary studies demonstrate that high-quality nursing interventions during enhanced abdominal CT scans yield significantly higher image quality [27]. As a consequence, radiology teams must assemble a variety of measures in order to improve stomach dilatation and illness detection.

According to the study, the BMI affected gastric dilatation scores. This is due to the positive correlation between gastric volume and BMI [28]. Therefore, disparities in gastric capacity should be created in different body mass indexes across the population. In accordance with the ordinal logistic results, the BMIs had impact on the factors of gastric dilatation according to the ordinal logistic results. Therefore, to corroborate the present findings, investigations with large sample numbers over a range of BMIs and gastric content levels would be required.

The variables affecting gastric dilatation included food consumption, education level and water dosage. These findings may have meaningful implications for developing clinical intervention strategies. Based on findings, the image of stomach dilatation in fasting patients is better than that of ate patients. Food residual limits the diagnosis of gastric, including chili, alcohol, etc. negative impacts on gastric mucosal integrity because chili may produce gastric mucosal injury comparable to that seen with aspirin; on the other hand, alcohol directly damages mucosal-caused gastritis [10; 29; 30]. Based on these considerations, patients should fast before gastric CT screening to ensure optimal mucosal visualization unaffected by dietary factors. Previous research has shown that higher levels of educational attainment translate into higher levels of health literacy [31]. Meanwhile, patients who had a higher level of education were significantly more likely to correctly believe the knowledge of the CT examination [32]. To promote patients' gastric dilatation and stomach lesion display, we need provide various health education materials about the readiness of abdominal CT scanning.

The volume of water affects gastric dilatation. One of the parameters influencing optimal gastric dilatation is the overall amount of water ingested. It is important to point out that gastric wall dilatation is a prerequisite for detecting gastric illness. According to the research, the score of 5 points was superior than the other scores. Additionally, when stomach dilatation was scored 5 points, the median amount of water consumed was 1000 ml. Nevertheless, patients may feel satiation in the wake of drinking more water [33]. For patients to take a more active role in promoting stomach dilatation. Otherwise, Bouras *et al.* [34] found that gastric volume was different in males and females. Conversely, the study didn't identify gender as a significant factor. Future multicenter studies should establish optimal pre-operative gastric opacification thresholds on CT scans across diverse cohorts with gastrointestinal pathologies.

CONCLUSION

Suboptimal gastric filling occurred in a significant proportion of abdominal contrast-enhanced CT

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examinations. According to the study, the influencing parameters of gastric dilatation were education level, dietary consumption, BMI, water dosage and ethnicity. Furthermore, they support strengthening patient education programs for CT preparation and prompt radiology departments to implement personalized care plans.

***Limitation*:** First, the proportion of patients in this single-center research were from Southwest China, which may not adequately reflect all abdominal contrast-enhanced CT patients in China. Multicenter research should be designed in the future. Second, there were no in-depth investigations of patients' sensations when they drank water to fill the gastric cavity.

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***Ethical considerations*:** The study received approval from the ethics committee West China Hospital (Approval No.: 2020-1289), and each patient signed a written informed consent form.

***Author Contributions*:** L.Z., R.Y., D.W., and Q.J.; designed the study. Q.J., K.Q., X.Z., Z.Z.; collected data and collated the data. L.Z., R.Y., N.H. and D.W.; guided the research and coordinated the work. Q.J. and D.W.; analyzed the data. Q.J. and L.Z.; edited the manuscript.

***Patient or public Contribution*:** Thank you to everyone who participated in the study. They performed a full gastric fill, done the CT scan, and, following patient interpretation of the State-Trait Anxiety Inventory, replied the scale on his own. We finished grading images, collecting and analyzing the data based on the previously mentioned effort. While expressing our gratitude to our technologists and radiologist for their assistance with our study.

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REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, *et al.* (2018) Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians, **68**: 394-424.*
2. Coates MM, Kintu A, Gupta N, *et al.* (2020) Burden of non-communicable diseases from infectious causes in 2017: a modelling study. *The Lancet Global Health, **8**: e1489-e1498.*
3. Etemadi A, Safiri S, Sepanlou SG, *et al.* (2020) The global, regional, and national burden of stomach cancer in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease study 2017. *The Lancet Gastroenterology & Hepatology, **5**: 42-54.*
4. Zhang X, Li M, Chen S, *et al.* (2018) Endoscopic screening in Asian countries is associated with reduced gastric cancer mortality: A meta-analysis and systematic review. *Gastroenterology, **155**: 347-354. e349.*
5. Zong L, Abe M, Seto Y, *et al.* (2016) The challenge of screening for early gastric cancer in China. *The Lancet, **388**: 2606.*
6. Cao M, Li H, Sun D, *et al.* (2020) Cancer burden of major cancers in China: A need for sustainable actions. *Cancer Communications, **40**: 205-210.*
7. Lee Y-H, Chan W-H, Lai Y-C, *et al.* (2022) Gastric hydrodistension CT versus CT without gastric distension in preoperative TN staging of gastric carcinoma: analysis of single-center cancer registry. *Scientific Reports, **12**: 11321.*
8. David A. and Mahvi DM (2017) Sabiston textbook of surgery, tweenty first ed., pp. 1196-1239 [J Courtney M. Townsend, R. Daniel Beauchamp, B. Mark Evers and K L. Mattox, editors].
9. Seong Ho Park, Hyun Kwon Ha, Min-Jeong Kim, *et al.* (2005) False-negative results at multi–detector row CT colonography multivariate analysis of causes for missed lesions. *Radiology, **235**: 495-502.*
10. Guniganti P, Bradenham CH, Raptis C, *et al.* (2015) CT of gastric emergencies. *Radiographics, **35**: 1909-1921.*
11. Shimizu K, Ito K, Matsunaga N, *et al.* (2005) Diagnosis of gastric cancer with MDCT using the water-filling method and multiplanar reconstruction: CT–histologic correlation. *American Journal of Roentgenology, **185**: 1152-1158.*
12. Kumano S, Okada M, Shimono T, *et al.* (2012) T-staging of gastric cancer of air-filling multidetector-row CT: Comparison with hydro-multidetector-row CT. *European Journal of Radiology, **81**: 2953-2960.*
13. Yun C, Chen J-SH, Wu D-C, Kang W-Y, Hsieh J-S, Jaw T-S, Wu M-T, Liu G-C (2007) Gastric cancer preoperative local staging with 3D multi-detector row CT--correlation with surgical and histopathologic results.pdf. *Radiology, **242**: 472-478.*
14. Winklhofer S, Lin WC, Wang ZJ, *et al.* (2019) Comparison of positive oral contrast agents for abdominopelvic CT. *Am J Roentgenol, **212**: 1-7.*
15. Park KJ, Lee MW, Koo JH, *et al.* (2011) Detection of early gastric cancer using hydro-stomach CT: blinded vs unblinded analysis. *World J Gastroenterol, **17**: 1051-1057.*
16. Maury E, Belmans A, Bogaerts K, *et al.* (2024) Real-life effectiveness of sacubitril/valsartan in older Belgians with heart failure, reduced ejection fraction and most severe symptoms. *Scientific Reports, **14**: 13512.*
17. Moon CM, Kang HK, Jeong GW (2015) Metabolic change in the right dorsolateral prefrontal cortex and its correlation with symptom severity in patients with generalized anxiety disorder: Proton magnetic resonance spectroscopy at 3 Tesla. *Psychiatry and Clinical Neurosciences, **69**: 422-430.*
18. Feng ST, Wang M, Gao Z, *et al.* (2013) The influence of upper limb position on the effect of a contrast agent in chest CT enhancement. *Eur J Radiol, **82**: 1023-1027.*
19. Bath M and Mansson LG (2007) Visual grading characteristics (VGC) analysis: a non-parametric rank-invariant statistical method for image quality evaluation. *Br J Radiol, **80**: 169-176.*
20. Huh CH, Bhutani MS, Farf´an EB, *et al.* (2003) Individual variations in mucosa and total wall thickness in the stomach and rectum assessed via endoscopic ultrasound. *Physiological Measurement, **24**: N15-N22.*
21. Larsen MC, Yan BM, Morton J, *et al.* (2011) Determination of the relationship between gastric wall thickness and body mass index with endoscopic ultrasound. *Obes Surg, **21**: 300-304.*
22. Baert AL, Roex L, Marchal G, *et al.* (1989) Computed tomography of the stomach with water as an oral contrast agent technique and preliminary results. *Journal of Computer Assisted Tomography, **13**: 633-636.*
23. Kim HY (2013) Statistical notes for clinical researchers: Evaluation of measurement error 1: using intraclass correlation coefficients. *Restor Dent Endod, **38**: 98-102.*
24. Koo TK and Li MY (2016) A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med, **15**: 155-163.*
25. Huynh K, Baghdanian AH, Baghdanian AA, et al. (2020) Updated guidelines for intravenous contrast use for CT and MRI. *EmergRadiol, **27**:115-126.*
26. Kavanagh BD, Pan CC, Dawson LA, *et al.* (2010) Radiation dose-volume effects in the stomach and small bowel. *Int J Radiat Oncol Biol Phys, **76**: S101-107.*
27. Chen X and Li HX (2024) In senile patients with severe disease, the diagnostic effect of enhanced abdominal computerized tomography scan is affected by high quality nursing interventions. *International Journal of Radiation Research, **22**: 757-761.*
28. Elbanna H, Emile S, El-Hawary GE, *et al.* (2019) Assessment of the correlation between preoperative and immediate postoperative gastric volume and weight loss after sleeve gastrectomy using computed tomography volumetry. *World J Surg, **43**: 199-206.*
29. Gasbarrini A, D'Aversa F, Di Rienzo T, *et al.* (2014) Nutrients affecting gastric barrier. *Dig Dis, **32**: 243-248.*
30. Peterson WL (1996) The influence of food,beverage and NASIDs on gastric acid secretion and Mucosal Integrity. *Yale Journal of Biology and Medicine, **69**: 81-84.*
31. Rikard RV, Thompson MS, McKinney J, *et al.* (2016) Examining health literacy disparities in the United States: A third look at the national assessment of adult literacy (NAAL). *BMC Public Health, **16**: 975.*
32. Takakuwa KM, Estepa AT, Shofer FS (2010) Knowledge and attitudes of emergency department patients regarding radiation risk of CT: Effects of age, sex, race, education, insurance, body mass index, pain, and seriousness of illness. *Am J Roentgenol, **195**: 1151-1158.*
33. Hunt RH, Camilleri M, Crowe SE, *et al.* (2015) The stomach in health and disease. *Gut, **64**: 1650-1668.*
34. Bouras EP, Delgado-Aros S, Camilleri M, *et al.* (2002) SPECT imaging of the stomach comparison with barostat, and effects of sex, age, body mass index, and fundaplication. *Gut, **51**: 781-786.*

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