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Effect of sherbet timing on distension and evaluation of the esophagus with multidetector-row computed tomography

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KEYWORDS
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Abstract
Purpose: The goal of this study was to analyze the effect of oral sherbet application on esophageal distension and esophageal evaluation with thoracic multidetector-row computed tomography (MDCT) regarding sherbet timing.
Materials and methods: A total 120 patients (65 men, 55 women) with a mean age of 59.7 years who were given 4 g sherbet powder to be swallowed 60, 30 or 10 seconds before thoracic MDCT were included. Inner esophageal diameter was measured in three planes at three anatomic levels. Area of esophageal lumen and assessable length of the esophagus were calculated and statistically analyzed using repeated-measures-ANOVA and post-hoc-*t*-tests. Results were compared groupwise and intra-individually with previous examinations without sherbet.
Results: Intra-individual comparison and subgroup-analysis showed that esophageal distension was significantly better when sherbet was used (mean inner area: $1.98 \pm 0.66\,cm^2$ vs. $0.49 \pm 0.14\,cm^2$) ($P < 0.001$). After preparation, in average 80.2% of the esophageal length were assessable compared to 39.2% without sherbet ($P < 0.001$). Timing of sherbet administration within one minute before scan-start revealed no significant differences ($P = 0.9$), yet a shorter delay to scan-start led to the best results.

Abbreviations: CT, computed tomography; DLP, dose length product; CTDIvol, computed tomography dose index; MDCT, multidetector computed tomography; SD, standard deviation; s, seconds.

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Conclusion: Oral sherbet administration within one minute before scan-start improves esophageal distension and evaluation using thoracic MDCT. This method of esophageal preparation is simple, can easily be applied in clinical routine and may improve the diagnosis of esophageal pathologies.

Introduction

Thoracic multidetector-row computed tomography (MDCT) is a well-established imaging modality for the evaluation of the esophagus. However, subtle abnormalities may be overlooked due to physiological and anatomical conditions that lead to a collapsed lumen and a wall hard to be identified [1,2]. As a consequence, it may be reasonably assumed that the use of a dedicated esophageal preparation would help improve detection and diagnosis of a variety of esophageal pathologies.

According to the data from recent literature the application of sherbet or effervescent powder induces a distension of the esophagus which further facilitates its evaluation [3—7]. So far, the sherbet administration procedure was either quite time-consuming, no standardized protocols existed or an interruption of the technician's workflow occurred [3—7]. Especially, the effect of sherbet timing has not been assessed yet. Though, like known from contrast ingestion in MDCT and fluoroscopy the timing is decisive in examining the esophagus. Besides, despite a wide range of individual anatomical variations the effect of sherbet on the esophagus has not been evaluated intra-individually.

The aim of this study was to assess a feasible and convenient method to improve the esophageal distension and thereby the esophageal evaluation in chest MDCT by oral administration of sherbet with special respect to sherbet timing and intra-individual comparison.

Materials and methods

Study cohort and patient preparation

From June 2013 to October 2013, a total of 120 consecutive patients undergoing chest MDCT for various indications, mainly tumor staging, were included in this retrospective study. There were 65 men and 55 women, with a mean age of 59.71 ± 14.3 (SD) years [range 19—85 years]. Detailed information on patient demographics is given in Table 1.

Inclusion criteria were the availability of previous thoracic MDCT images which were obtained no longer than 12 months prior to the current examination using the same MDCT protocols. Those previous images of the same patient collective are referred to as the control group. Exclusion criteria were the presence of tracheostomy, acute dyspnea and emergency patients.

Table 1 Patient demographics.

	Mean age ± SD [range] (years)	Men (*n*)	Women (*n*)
Patient collective (120)	59.71 ± 14.3 [19—85]	65	55
Groups according to sherbet timing (40/group)			
10 seconds	58.40 ± 12.2 [32—79]	19	21
30 seconds	62.53 ± 10.9 [34—80]	21	19
60 seconds	60.43 ± 16.1 [19—85]	25	15

SD indicates standard deviation. No significant differences were found in between the three subgroups of sherbet timing ($P = 0.38$).

Each patient received 4 g of flavored sherbet powder (Ahoj-Brause, Frigeo, Remshalden, Germany) while being placed on the examination table. Swallowing was ordered within one minute prior to scan-start: either 60 seconds (s) before scan-start accompanied with the intravenous administration of iodinated contrast material, 30 seconds, or 10 seconds prior to scan-start (immediately before the breathing commands). The swallowing was timed and ordered by the technicians who applied one timing instruction (60, 30 or 10 s) throughout an entire working day. The timing changed each day in a recurring rhythm and patients were randomly assigned to the three subgroups (40 patients/group).

Data acquisition and MDCT protocol

All patients underwent contrast-enhanced chest MDCT with each acquisition performed during end-inspiratory breath hold and acquired using a 64-section MDCT unit (SOMATOM Sensation 64®; Siemens Healthcare, Forchheim, Germany). The following scan parameters were applied: 0.5 s gantry rotation time; tube voltage 120 kVp; effective tube current time product 110 mAs, using automated tube current modulation; 64 × 0.6 mm slice collimation; pitch 1.1. Multiplanar reconstructions with slices of 2 and 5 mm were obtained. No iterative reconstruction was used. For contrast enhancement 100 mL of iopromide 300 (Ultravist 300®; Bayer Schering Pharma, Berlin, Germany) were administered intravenously and the scan was initiated after a fixed start delay of 60 s. Radiation dose was documented in terms of