# **Clinical Protocol: Gastric Emptying - Solid**

## LAST REVIEWED DATE: 06/2020

**Responsible Division:** Division of Nuclear Medicine, Department of Radiology, UT Southwestern

### **Policy Basis for Procedure**

To establish the clinical protocol for solid gastric emptying study

### Overview

The solid Gastric Emptying Study demonstrates the movement of an ingested bolus of solid from the stomach into the small intestine. Various physiologic parameters may be quantified.

#### DESCRIPTION OF STANDARD PROCEDURE

#### Indications

- Diagnosis of functional gastric dysmotility.
- Symptoms suggestive of gastroparesis, e.g., postprandial nausea, bloating, pain.
- Severe gastroesophageal reflux poorly responsive to therapy
- Non-ulcer dyspepsia
- Diabetics with symptoms of gastroparesis or inability to adjust insulin to control blood sugar

### **Examination Time**

• Variable, range 2 to 4 hours.

### **Patient Preparation**

- Overnight fast minimum of 4 hrs.
- Cessation of medications that may affect gastric motility 2 days prior to gastric emptying
- The study should be done in the morning because the gastric emptying time varies with the time of day.

Blood glucose level 200mg/dl or less at the time of the study, following Society of Nuclear Medicine and Molecular Imaging guideline for adult solid meal gastric emptying study 3.0. Notification to the attending physician must be made if blood glucose is not within range (< 200mg/dl.) Technologist shall notify the attending physician for in-patients with blood glucose levels outside the given range. The attending physician will contact the referring physician alerting of the implications hyperglycemia has on gastric motility. If the glucose level is out of range for an outpatient, the attending physician may ask the patient to return when the glucose level is better controlled, or call the referring physician to discuss proceeding with the exam informing them of how hyperglycemia may adversely affect gastric motility.</li>

# Equipment & Energy Windows

- Gamma camera: Large or small field of view.
- Collimator: LEHR or LEGP parallel hole.
- Energy window: 20% window centered at 140 keV.
- 128 x 128 planar images

# Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical: Tc-99m-sulfur colloid
- Dose: 1 mCi (37 MBq).
  - Technique of administration: Oral over 10 minutes or less. One scrambled egg with salt and pepper if desired, one slice of toast jam allowed and 120 oz water

### Patient Position & Imaging Field

- Patient position: Adults: Standing if stable Infants: Supine.
  - Imaging field: Upper abdomen.

### **Acquisition Protocol**

• Have the patient ingest the test meal in 10 minutes or less time. Place the patient in a Standing position, ANT then POST to the camera. Acquire serial 1 minute ANT/POST images immediately after the patient finishes ingesting the meal: anterior and posterior if upright; anterior or left anterior oblique if supine. Image immediately upon consumption of the meal and 1h, 2h and 4h after ingestion of the meal. In-patients are to remain in the department

for the 1h images and brought back at the 4 hours post ingestion time. Two-hour images may be optional in these patients. Rapid emptying is determined based on the 1h imaging results.

- Process the data and have the radiologist determine if further imaging is required after 2h.
- Acquire images until the counts in the gastric region of interest have fallen by more than 1/2, but at least for 2 hours.

## **Optional Maneuvers**

• *Ensure Complete:* The meal consists of 237 ml Ensure Complete mixed with 2.0 mCi Tc-99m–sulfur colloid and shaken prior to consumption. This has a caloric

value of 350 kcal (28 % fat, 15 % protein, 57 % carbohydrate), high fat content meal with 11g of fat, gluten-free, suitable for lactose intolerance, is halal, and is kosher. This is not intended for patients with galactosemia. Ensure complete is offered in vanilla, strawberry, and milk chocolate.

# Position and Imaging Field

• Patient position: Upright if possible; supine if upright is not possible.

• Imaging field: Upper abdomen anterior and posterior.

### Processing

- Draw a region of interest around the entire stomach, excluding as much small intestine as permissable in each image (unless small intestine was visible on the initial image).
- Draw a background ROI
  - Apply the analysis software to calculate % emptied and retained at each time point and to make a time-activity curve with "time" on the X-axis and "gastric counts" on the Y-axis. For studies obtained with anterior and posterior projections, the activity is a geometric mean of the anterior and posterior activity. Activity must be decay corrected.

## Principle Radiation Emission Data - Tc-99m

- Physical half-life = 6.01 hours.
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Radiation	Mean % per disintegration	Mean energy (keV)
Gamma-2	89.07	140.5

### Dosimetry - Tc-99m-Sulfur Colloid Solid Meal

Organ	rads/1 mCi	mGy/37
MBq		
Large intestine	0.46	4.6
Small intestine	0.24	2.4
Stomach	0.24	2.4
Ovaries	0.08	0.8
Whole body	0.02	0.2
Testes	0.004	0.04
Effective dose	rems/1 mCi	mSv/37 MBq
Whole body	0.035	0.35

#### Normal Value

# Table 1: Normal Emptying Times (non-parametric; 5<sup>th</sup>-95<sup>th</sup> percentile)

Solid	T1/2 (hr)	Emptying @ 1 hr	Emptying @ 2 hr	Emptying @ 4 hr
Ensure Complete	1.4 (1.3-1.5)	>22% (22-49%)	>49% (49-87%)	>86 (86-100%)
Standard meal	$1.5 \pm (1.4-1.6)$	>10% (10-63%)	>40% (40-70%)	>90% (90-100%)
		>70%=rapid		

#### **REFERENCES:**

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