

# When innovation hurts: Increasing radiation doses from modern CT scanners in obese and overweight patients

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## Background

- Superior mesenteric venous thrombosis (SMVT) is described as a high-density lesion in superior mesenteric vein wall surrounding a central filling defect in contrast enhanced abdomen-pelvis CT examination presents with abdominal pain, vomiting, fever, or bloody stools which is rare but potentially lethal condition that occurs in 5-15% of mesenteric ischemia. [1]
- Moreover, the mortality rate of mesenteric venous thrombosis is as high as 2% which is a great challenge in patient management. [2]
- Computed tomography (CT) with and without intravenous and oral contrast is recommended for enhancing the filling defect in the mesenteric vein as initial screening imaging due to its availability as well as 90% sensitivity in diagnosis.
- Many such imaging modalities and interventions expose patients to cumulative radiation dose and cumulative effective dose (CED), subsequently, that may put patients in risk of cancer, known and unknown harms.

## Goal

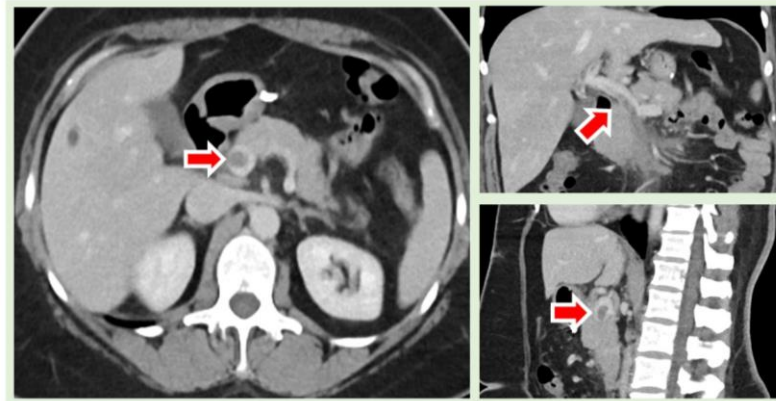
To estimate the cumulative radiation dose from the recurrent imaging examinations (CT and fluoroscopy-guided interventional radiology) from initial diagnosis, follow-up, and treatment of patients with acute superior mesenteric venous thrombosis.

## Method

- All adult patient (age>18 years) were identified with acute SMVT between 2016-2022 who underwent at least two abdomen-pelvis CT exams.
- Subjects with chronic SMVT and SMVT related to pancreatic cancer were excluded.

The final sample size ( $n=26$ )  
Male:female 20:16, age (mean $\pm$ SD=50  $\pm$ 15)

- For each patient we recorded the following details:
  - Frequency and details of all imaging tests for initial diagnosis and follow-up for CT (CTDIvol and DLP), MRI, and ultrasound.
  - The details of any interventional (IR) procedures (dose area product – DAP), fluoroscopy time).
  - The effective doses from CT, IR and nuclear medicine (PET-CT)



The demonstration of acute superior mesenteric venous thrombosis in abdomen-pelvis computer tomography (CT) on axial, coronal, and sagittal views.

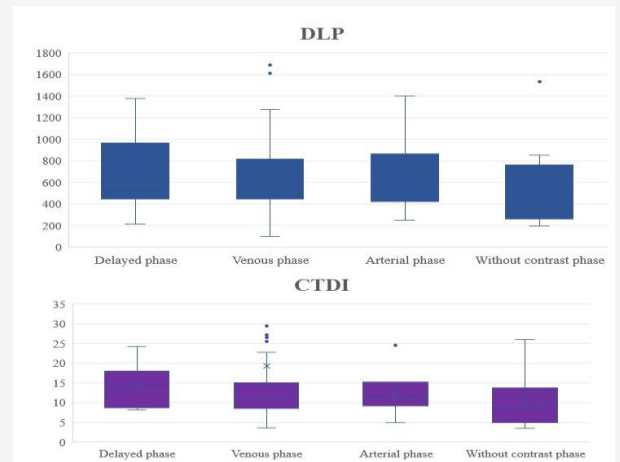
## Results

- ✓ Of total 36 patients, 35 were diagnosed with the SMVT on CT and 1 with abdominal ultrasound.
- ✓ Patients had  $4 \pm 2$  (mean  $\pm$  SD) imaging tests with the range of 2-15 CT over the course of their diagnosis to follow-up. The interval between the first and last CT

imaging was  $153 \pm 311$  days (average  $\pm$  SD), with the range of 0-1801 days.

- ✓ The median cumulative radiation doses for patients with SMVT: CTDIvol 11.1 mGy, DLP 2545 mGy.cm and effective dose 44 mSv.

Phase	CTDIvol (mGy) (median,IQ1-IQ3)	DLP (mGy.cm)
Non-contrast	9 (7-11)	460
Arterial	11 (10-14)	506
Venous	11 (8-15)	595
Delayed	13 (9-16)	577



Distribution of the median CTDI volume and total DLP values for each phase (delayed, venous, and arterial phases and without contrast phase)

## Conclusions

Our study highlights high cumulative doses and frequency of multiphase CT in patients with SMVT. Use of MR and ultrasonography must be increased in patients with SMVT to decrease associated radiation doses.