

Case report [ASNMT]

Oral Ga-67 Colonic Transit Scintigraphy in Patients with Chronic Constipation: A Single-Institution Experience in Taiwan

Wen-Wen Cheng^{1*} and Kao-Yin Tu²

Department of Nuclear Medicine, MacKay Memorial Hospital ¹Tamsui Branch ²Taipei Headquarters, Taiwan

***Corresponding Author:** Wen-Wen Cheng, Department of Nuclear Medicine, MacKay Memorial Hospital, No.45, Minsheng Rd., Tamsui Dist., New Taipei City, Taiwan(R.O.C), Tel: +886-2-2809-4661#2299, E-mail: chengwwnike.b201@mmh.org.tw

Abstract

Introduction: Constipation is one of the common modern diseases today. Distinguishing between primary and secondary (organic) constipation is essential for appropriate treatment. In 1999, Dylan Bartholomeuse et al. conducted a comparative study of Ga-67 and In-111, finding that the results of both were very similar. This is good news for Nuclear Medicine in Taiwan, as Ga-67 is more accessible and cheaper than In-111. Therefore, the evaluation metrics of our department also refer to the conclusions of this study.

Material and Methods: Our clinical procedure involves patients ingesting 300 c.c. of water or orange juice mixed with 1 mCi Ga-67, followed by imaging at 6, 24, 48, and 72 hours. Reviewing patients from 2020 to 2025, there were a total of 40 patients who underwent colon transit study in our department, ranging in age from 20 to 73 years (with an average age of 44.3 years). **Results:** Among them, 15 were normal patients with an average half-clearance time of 21.72 hours, and 24 were abnormal patients with an average half-clearance time of 88.25 hours. Additionally, one patient was unable to complete the scan for personal reasons. Imaging from normal patients showed the activity of the isotope in the colon: the ascending colon (A) became visible at 6 hours and had almost no radioactive residue after 72 hours; the transverse colon (T) and descending colon (D) were visible around 24 to 48 hours; and the sigmoid colon (S) and rectum (R) were visible from 24 to 72 hours. **Conclusions:** Nuclear medicine offers significant advantages in the diagnosis of constipation, providing clinicians with critical functional information that enables more accurate identification of the underlying causes and the development of appropriate treatment strategies.

Keywords: Constipation, Colon Transit Study, Ga-67

Introduction

Constipation is a prevalent modern health issue, potentially signaling underlying conditions such as tumors or irritable bowel syndrome. Statistics show that over 5 million people in Taiwan suffer from constipation, with nearly 25% of those aged 20–50 affected. [1] Among those over 65, the rate rises to 40%, with over 400 million laxatives consumed annually. [2] Although women are most affected, men, children, and the elderly are also susceptible. Differentiating between primary and secondary (organic) constipation is crucial for targeted treatment. Routine physical exams like stool tests cannot assess bowel motility, necessitating colonoscopy, X-ray, or nuclear medicine imaging. The nuclear medicine offers non-invasive, low-radiation diagnostics with functional imaging and data, aiding physicians in better understanding patient conditions.

The earliest international use of Cr-51 for gastrointestinal transit studies dates back to 1962. [3] The first comprehensive whole-gut transit evaluation was in 1985 using ¹¹¹In-DTPA, and In-111 has remained common. [4] In 1999, Dylan Bartholomeuse et al. compared Ga-67 and In-

111, finding similar results. [5] This benefits Taiwan's nuclear medicine field due to Ga-67 easier access and lower cost. Ga-67 is minimally absorbed by other gastrointestinal organs and is excreted via the intestines. Its physical half-life of 78.3 hours makes it ideal for evaluating bowel motility.

Methods

Our clinical standard operating procedure is based on guidelines from the society of nuclear medicine and molecular imaging (SNMMI) and the european association of nuclear medicine (EANM). [6] Patients must avoid laxatives the day before the exam and fast for 8 hours prior. On the day of the exam, they ingest 300 c.c. of water or orange juice mixed with 1mCi Ga-67. Imaging is performed at 6, 24, 48, and 72 hours. Patients may eat normally but must avoid medications that stimulate bowel motility. Imaging is conducted using infinia gamma camera of GE company with a medium energy general purpose (MEGP) collimator. Energy peaks are set at 93, 184, and 300 keV with window settings of $\pm 26\%$, $\pm 20\%$, and $\pm 20\%$, respectively. Matrix size is 128×128 , and static anterior-posterior abdominal images are acquired for 10 minutes.

Image analysis uses curve fitting, treating the 6-hour image as 100% activity. Subsequent images are used to calculate half-clearance time based on radiation excretion, factoring in Ga-67 physical half-life of 78.3 hours.

Analysis

This study retrospectively analyzed patients who underwent colon transit studies from September 2020 to July 2025.

Results and Discussion

Among the 40 patients (aged 20–73, average 44.6 years), 15 were normal (average half-clearance time 21.72 hours), and 24 were abnormal (average 88.25 hours). Five patients could not be evaluated due to low radiation excretion at 72 hours, and one did not complete the scan for personal reasons. (Table 1)

Table 1. Total number of colon transit study from 2020 to 2025

Number	Normal		Abnormal	
	<24 hours	25~28.8 hours	>28.8 hours	Unable to estimate
Male & Female	13	2	19	6
Female	10	2	17	5*
Male	3	0	2	1

* One patient did not complete the scan for personal reasons

Of the 34 female patients (average age 42.35 years), one did not complete the scan. Twelve were normal (half-clearance time 11–26.9 hours, average 18.59 hours), and four could not be evaluated due to low radiation excretion. Seventeen abnormal cases had half-clearance times ranging from 33.2 to 669 hours (average 138.44 hours). Among the six male patients (average age 57.33 years), three were normal (average 21.33 hours), two were abnormal (average 38.05 hours), and one could not be evaluated. (Fig.1, Table. 2)

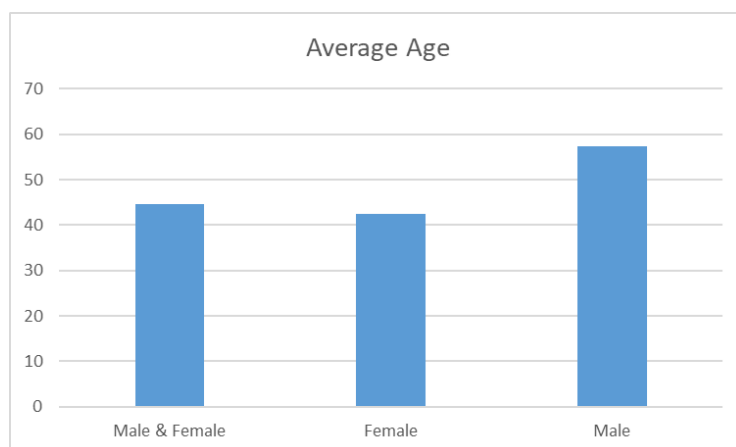


Fig. 1. Mean age of examined patients

Table 2. Average half-clearance time of colon transit study from 2020 to 2025

Average half-clearance time	Normal		Abnormal
	<24 hours	25~28.8 hours	>28.8 hours
Male & Female	19.13	26.89	88.25
Female	16.93	26.89	138.44
Male	21.33		38.05

Imaging showed that 13 normal patients reached the left colon (descending, sigmoid, rectum) by 24 hours, and two slower cases by 48 hours. (Fig.2) Nineteen abnormal patients retained moderate to severe radiation at 72 hours. (Fig.3) One patient's curve fitting yielded a half-clearance time of 46.14 hours. (Fig.4) Normal imaging showed ascending colon (A) visible at 6 hours and nearly cleared by 72 hours; transverse (T) and descending colon (D) visible between 24–48 hours; sigmoid (S) and rectum (R) between 24–72 hours. (Fig.5) Of the 15 normal patients, 13 cleared by 24 hours (average 19.13 hours; females 16.93, males 21.33 hours). No male patients had half-clearance times between 25–28.8 hours; the two in this range were female (average 26.89 hours).

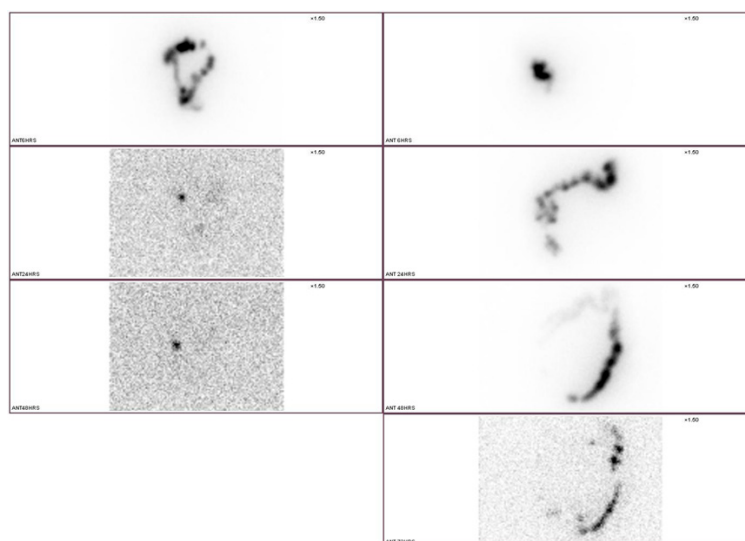


Fig. 2. Both individuals shown were classified as normal patients. The patient on the left had a half-clearance time of 15.5 hours, with imaging clearly indicating substantial radiotracer excretion by 24 hours. The patient on the right had a half-clearance time of 22.6 hours, and the 72-hour scan demonstrated a marked reduction in residual radiotracer activity.

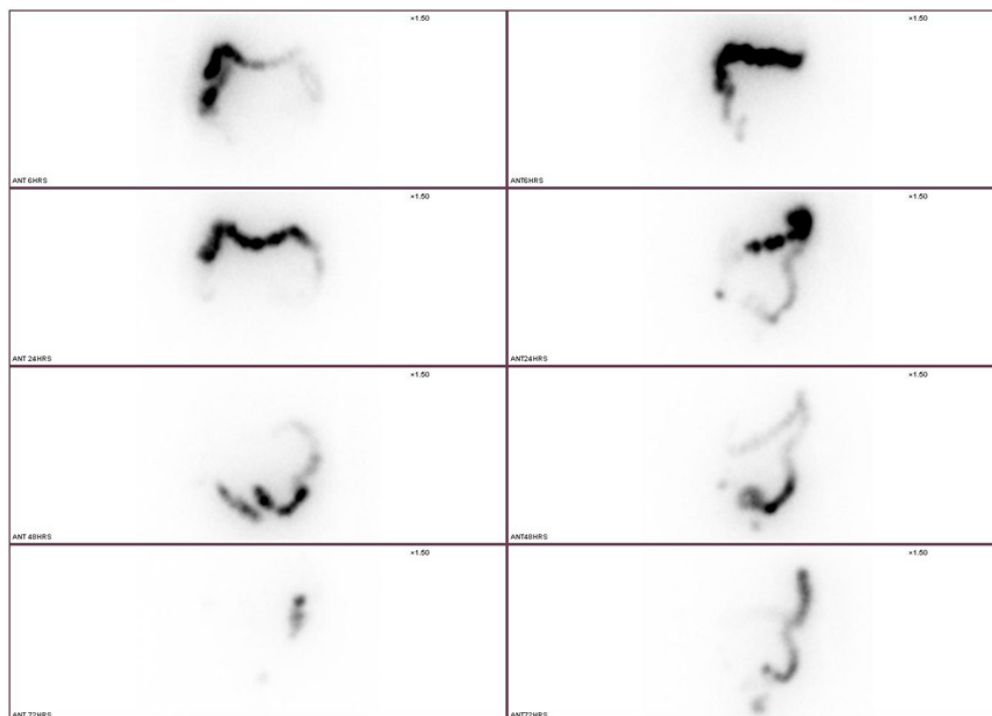


Fig. 3. Both individuals depicted were classified as abnormal patients. The patient on the left had a calculated half-clearance time of 46.1 hours, with imaging at 72 hours revealing moderate residual radiotracer activity. In contrast, the patient on the right exhibited substantial residual activity at 72 hours, preventing accurate estimation of the half-clearance time.

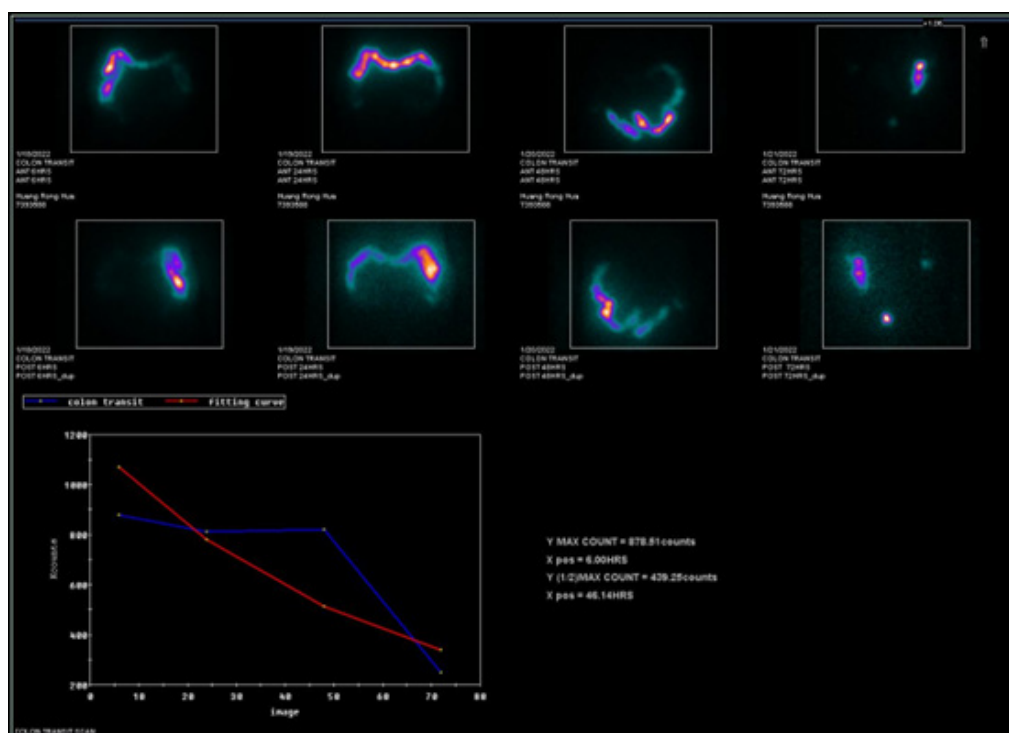


Fig. 4. Curve fitting yielded a half-clearance time of 46.14 hours for this patient, who represents the abnormal case on the left side of Fig 3.

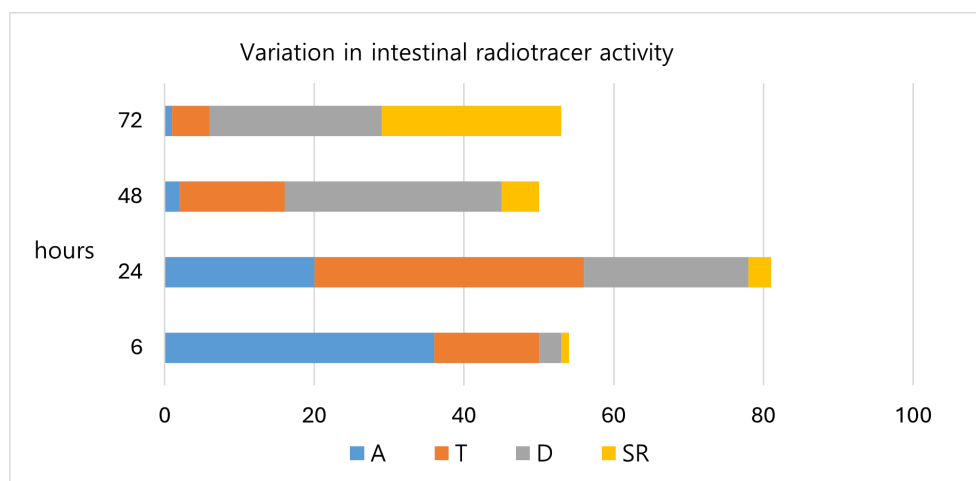


Fig. 5. Imaging of normal patients revealed the transit of radiotracers through the colon: the ascending colon was visualized at 6 hours, with minimal residual activity at 72 hours; the transverse and descending colon were typically visualized between 24 and 48 hours; and the sigmoid colon and rectum were between 24 and 72 hours.

Conclusion

In summary, constipation is more prevalent in women and affects all age groups. (Fig.6) Sex differences in colonic transit likely reflect hormonal modulation and lifestyle factors, explaining the higher prevalence of constipation among women and adding clinical relevance to the findings. [7,8,9] Nuclear medicine offers significant advantages in diagnosing constipation, providing functional insights that help clinicians identify causes and tailor treatments. With advancing technology and broader application, nuclear medicine is poised to play a greater role in gastrointestinal diagnostics.

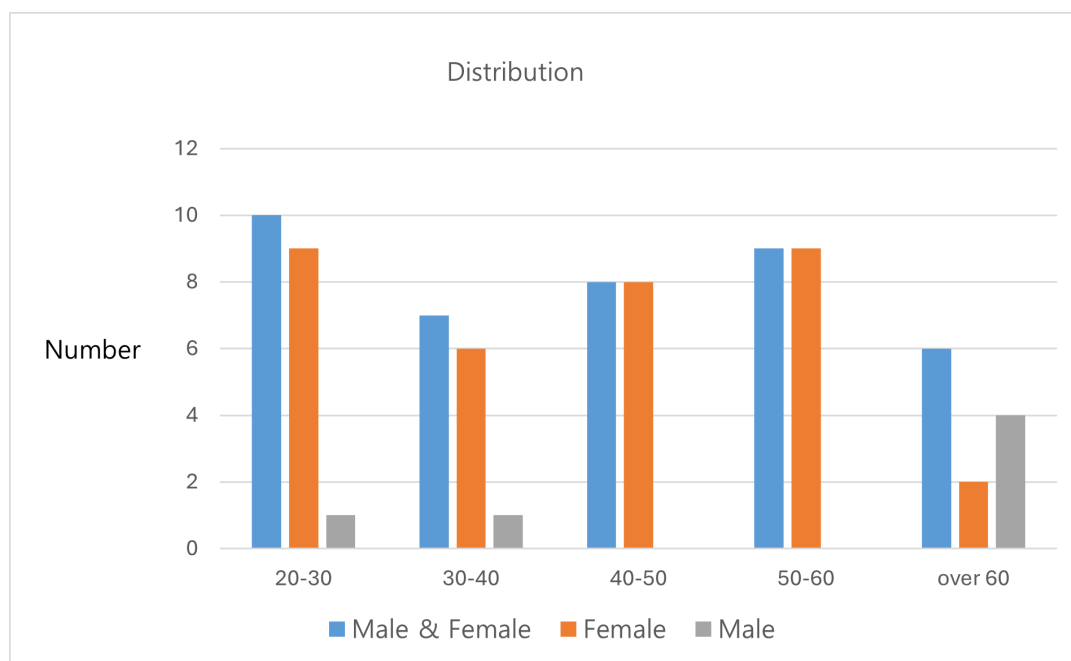


Fig. 6. A higher proportion of female patients was noted, with constipation occurring in individuals of all age ranges.

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Conflicts of interest

The author declared no conflicts of interest.

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