Surg. Gastroenterol. Oncol. 2025;30(2):76-80 DOI: 10.21614/sgo-783

Usefulness of Sagittal View in CT Imaging as Preoperative Evaluation for Advanced Rectal Cancer

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ABSTRACT

Background: Computed tomography (CT) is generally performed in preoperative evaluations of patients with colorectal cancer. Tumor location and extent are commonly evaluated in only axial-view CT images. Here, we evaluated the overall longitudinal structure and circumference of tumors by using both axial- and sagittal-view CT images acquired since January 2024.
Methods: From January 2024 to March 2025, twenty-three patients with colorectal cancer who underwent anterior resection at our hospital were retrospectively enrolled in this study. The overall longitudinal structure and circumference of tumors were evaluated by using both axial- and sagittal-view CT images.
Results: In all four patients who underwent low anterior resection, the overall longitudinal structure and circumference of the tumor were detected via sagittal-view CT images. The tumor circumference could be determined using axial-view CT images; however, the overall longitudinal structure of the tumor could not be determined. In fifteen (79%) of the nineteen patients who underwent high anterior resection, both the overall longitudinal structure and circumference of the tumor could be determined via sagittal-view CT images. The tumor circumference but not the overall longitudinal structure could be determined using axial-view CT images.
Conclusions: Our results suggest that the sagittal-view CT images are very useful for evaluating both the overall longitudinal structure and circumference of tumors in patients with rectal cancer located below the promontory.
Keywords: computed tomography, sagittal view, axial view, rectal cancer, preoperative evaluation

INTRODUCTION

Computed tomography (CT) is generally performed as a preoperative evaluation for patients with colorectal cancer (1,2). Tumor location and extent are commonly evaluated using only axial CT images (3). However, the overall longitudinal structure of the tumor cannot be evaluated on the basis of axial CT images. It is very useful for colorectal surgeons to obtain the overall longitudinal structure of the tumor in front of the sacrum preoperatively when they divide

Received: 27.04.2025
Accepted: 16.06.2025

the mesorectal fascia and the sacrum, which is known as the total mesorectal incision (TME) (4). Here, we evaluated the overall longitudinal structure and circumference of tumors by using both axial and sagittal CT images acquired since January 2024. To elucidate the usefulness of sagittal CT images in preoperative evaluations for patients with advanced rectal cancer, we performed the present retrospective study at our institution.

MATERIAL AND METHODS

Patients

From January 2024 to March 2025, twenty-three patients with colorectal cancer who underwent anterior resection at our hospital were retrospectively enrolled in this study. All patients received routine imaging for preoperative evaluations at our hospital, including contrast-enhanced CT from the chest to the pelvis. All CT examinations were performed with the Canon Aquilion Prime SP 80-slice CT system. The overall longitudinal structure and circumference of the tumor were detected by using both axial and sagittal CT images.

The study protocol was approved by the Ethics Committee for Biomedical Research of the National Hospital Organization Nishisaitama-chuo National Hospital Review Board (2025-2), and all patients or their family members provided written informed consent for the use of their data.

CT Imaging Evaluations

In the axial view evaluation, some axial-view cross-sectional images containing the tumor from the oral side to the anal side were used to determine the overall longitudinal structure and circumference of the tumor. In the sagittal view evaluation, one sagittal-view cross-sectional image containing the rectum from the promontory to the coccyx was used to determine the overall longitudinal structure of the tumor. Some sagittal-view cross-sectional images containing the tumor from the right side to the left side were used to determine the tumor circumference. The evaluations were performed by three colorectal surgeons (T.M., Y.T., and H.K.) with more than ten years of experience in rectal cancer imaging; all three surgeons were members of the multidisciplinary board.

Statistical Analysis

Continuous variables are expressed as the means and ranges. The χ^2 test was used to compare categorical data between groups. A p value of less than 0.05 was considered to indicate statistical significance. All the data were analyzed with the Statistical Package for Social Sciences (SPSS) 24.0 (IBM SPSS, Tokyo, Japan).

RESULTS

Clinical Patient Characteristics (table 1)

The mean age of the twenty-three patients, including twelve males and eleven females, was 71.9 years, ranging from 30-91 years. The mean distance between the tumor and anal verge was 17.1 cm, ranging from 10-22 cm. Among the patients, nineteen individuals underwent high anterior resection; the other four patients underwent low anterior resection. In total, four pT2 (17%), fourteen pT3 (61%), and five pT4 (22%) patients were enrolled in the present study.

Number of Tumors Detected in the CT Images (table 2)

In patients who underwent low anterior resection, both the overall longitudinal structure and the circumference of the tumor could be determined on the basis

Table 1 - Clinical Patient Characteristics

Characteristic	n=23
Mean age (range), years	71.9 (30 - 91)
Gender, n (%)	
Male	12 (52)
Female	11 (48)
Mean distance between tumor and anal verge (range), cm	17.1 (10 - 22)
Surgical procedure, n (%)	
High anterior resection	19 (83)
Low anteriot resection	4 (17)
Pathological T stage, n (%)	
pT2	4 (17)
pT3	14 (61)
pT4	5 (22)
Histological type, n (%)	
Well, moderately	23 (100)
Poorly, mucinous	0 (0)
Lymphatic invasion, n (%)	
Absent	14 (61)
Present	9 (31)
Venous invasion, n (%)	
Absent	13 (57)
Present	10 (43)
Lymph node metastasis, n (%)	
Absent	9 (31)
Present	14 (61)

The data are presented as mean (range) or as n (%).

Table 2 - Number of tumors detected in CT imaging

Description	Detected	Not detected
Low anterior resection group, n=4		
Sagittal view		
Longitudinal complete picture	4 (100)	0 (0)
Circumference	4 (100)	0 (0)
Axial view		
Longitudinal complete picture	0 (0)	4 (100)
Circumference	4 (100)	0 (0)
High anterior resection group, n=19		
Sagittal view		
Longitudinal complete picture	15 (79)	4 (21)
Circumference	15 (79)	4 (21)
Axial view		
Longitudinal complete picture	0 (0)	19 (100)
Circumference	19 (100)	0 (0)

The data are presented as n (%).

of sagittal-view images. The circumference of the tumor could also be determined according to axial-view images. However, the overall longitudinal structure of the tumor could not be determined on the basis of axial-view images.

Among the patients who underwent high anterior resection, both the overall longitudinal structure and the circumference of the tumor could be determined on the basis of sagittal-view images for fifteen (79%) patients. For the other four patients whose tumors were in the intestine above the promontory, neither the overall longitudinal structure nor the circumference of the tumor could be determined via sagittal-view images. On the other hand, the circumference of the tumor could be determined on the basis of axial-view images for all patients. However, the overall longitudinal structure of the tumor could not be determined according to axial-view images for any patients.

CT Imaging of a Patient with Obstructive Rectal Cancer

The results for one of the four patients who underwent low anterior resection for obstructive rectal cancer before chemoradiation therapy are shown in *fig. 1*. The left and right sides of the figure show the axial-view and sagittal-view cross-sectional images, respectively. The overall longitudinal structure of the tumor could be detected in only one sagittal-view cross-sectional image containing the rectum from the promontory to the coccyx. The overall longitudinal structure of the tumor could be detected more easily in the sagittal-view cross-sectional image than in the axial-view cross-sectional image. *Fig. 2* shows a preoperative CT image after chemoradiation therapy. Changes occurring in response to chemoradiation therapy could easily be observed in the sagittal-view cross-sectional image.

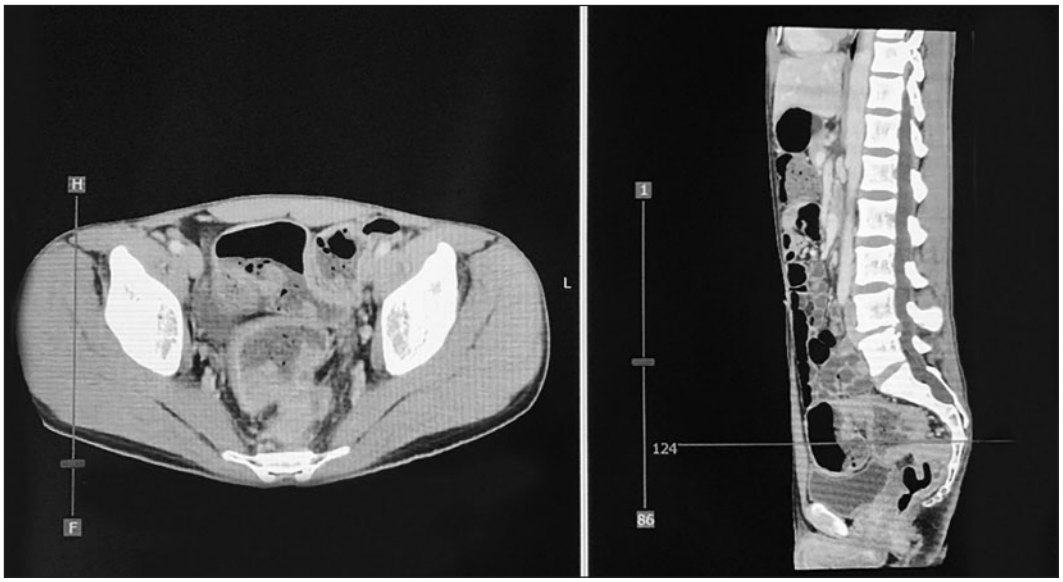

Figure 1 - Preoperative CT imaging of a patient with obstructive rectal cancer before chemoradiation therapy. The left and right sides of the figure show the axial-view and sagittal-view cross-sectional images, respectively. The overall longitudinal structure of the tumor could be detected more easily in the sagittal-view cross-sectional image than in the axial-view cross-sectional image.

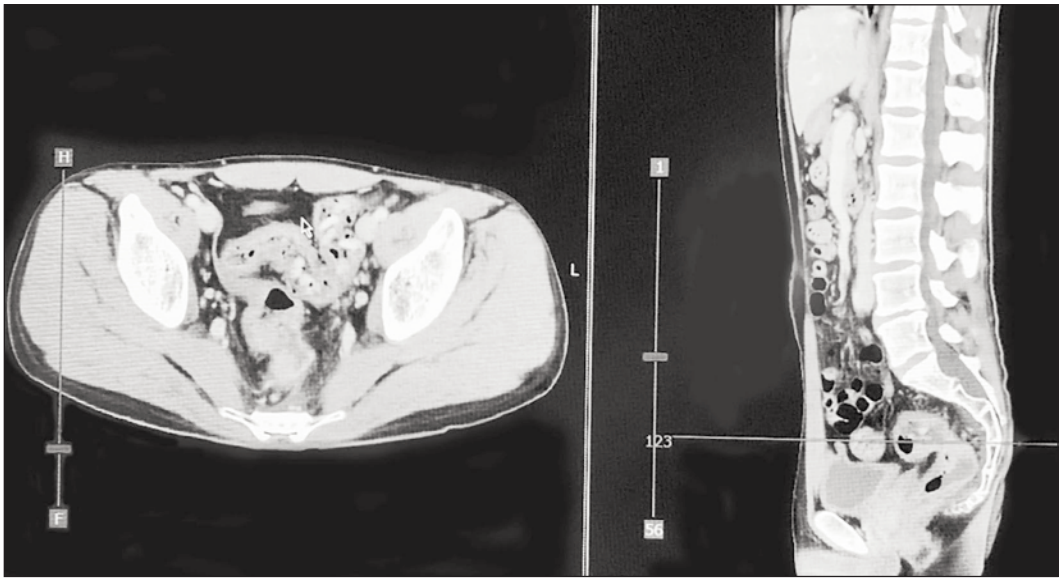

Figure 2 - Preoperative CT imaging of a patient with obstructive rectal cancer after chemoradiation therapy. The left and right sides of the figure show the axial-view and sagittal-view cross-sectional images, respectively. Changes occurring in response to chemoradiation therapy could easily be observed in the sagittal-view cross-sectional image.

Tumor detection rates via CT imaging (Table 3)

For all patients, the overall longitudinal tumor structures could be detected more easily in the sagittal-view cross-sectional images than in the axial-view cross-sectional images. Moreover, the overall longitudinal tumor structure could not be determined on the basis of the axial-view cross-sectional images.

DISCUSSION

Approximately thirty years ago, the barium enema was the primary radiological diagnostic method for colorectal cancer worldwide since colonoscopy was not the method of choice for screening for this disease (5). Following the introduction of colonoscopies, the barium enema was applied only when a colonoscopy was not possible or was unsuccessful (6). With the development of cross-sectional imaging methods, including CT and magnetic resonance imaging (MRI), colorectal cancer can more easily be detected (7-10). MRI enables preoperative assessments of the depth of tumor penetration and the presence of local lymph node metastases (11). CT can be used to determine the extent of tumors and the occurrence of distant metastases preoperatively (3). In recent years, colonoscopy, CT and MRI have become mandatory in the preoperative evaluation of patients with colorectal cancer (12-14). The tumor location and extent are commonly evaluated on the basis of only axial-view CT images. However, the overall longitudinal structure of the tumor cannot be evaluated according to these axial-view CT images. The overall longitudinal structure of the tumor in front of the sacrum is very useful information for colorectal surgeons when TME is performed.

Axial-, sagittal-, and coronal-view images can be obtained simultaneously via 64-slice CT scans, known as multislice computed tomography (MSCT), which has been used for diagnoses since 2004 (15). In recent years, CT colonography has attracted attention as an alternative approach to determine the location and circumference of tumors in preoperative evaluations (16). However, the tumor location and extent have been commonly evaluated on the basis of only axial-view CT images (3). Here, we evaluated the overall longitudinal structure and circumference of tumors on

Table 3 - Tumor detection rates in CT imaging

Description	Sagittal view	Axial view	p-Value
Low anterior resection group, n=4			
Longitudinal complete picture	100	0	< 0.01
Circumference	100	100	
High anterior resection group, n=19			
Longitudinal complete picture	79	0	< 0.01
Circumference	79	100	

The data are presented as %.

the basis of both axial- and sagittal-view CT images acquired since January 2024.

In the present study, both the overall longitudinal structure and the circumference of the tumor were determined on the basis of sagittal-view images of patients with rectal cancer located below the promontory. Additionally, the sagittal-view cross-sectional images were used to evaluate the effectiveness of chemoradiation therapy. Both axial- and sagittal-view CT images should be used in preoperative evaluations to evaluate the overall longitudinal structure and the circumference of tumors for patients with rectal cancer located below the promontory.

One report has indicated that acquiring pelvic CT scans during the pre-treatment stage does not provide clinical benefits for the primary evaluation of rectal cancer. However, the depth of tumor invasion and extramural invasion of the circumference of the resection margin can be evaluated via sagittal-view cross-sectional CT images. Since contrast-enhanced CT scans from the chest to the pelvis can be used to determine the occurrence of distant metastases preoperatively, they should be performed before MRI scans. The necessity of MRI can be determined following contrast-enhanced CT scans from the chest to the pelvis.

CONCLUSION

Despite potential limitations, our results suggest that sagittal-view CT images are very useful for evaluating both the overall longitudinal structure and the circumference of tumors in patients with rectal cancer located below the promontory.

Author's Contributions

Study conception and design: H.K. Acquisition of data: All authors. Analysis and interpretation of data: All authors. Drafting of manuscript: H.K. Critical revision of manuscript: All authors. Final approval of the version to be published: All authors.

Conflict of Interest

The authors declare no financial conflict of interest.

Ethics Approval

The Ethics Committee for Biomedical Research of the National Hospital Organization Nishisaitama-chuo National Hospital Review Board approved the protocol (2025-2).

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