



## Over-diagnosis for preoperative T staging of colorectal cancer - A case series

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### ABSTRACT

**Introduction:** Recent progressive imaging technology such as multiplanar reconstruction on computed tomography (CT) and colonoscopy has made preoperative T staging of colorectal cancer (CRC) more accurate. Nevertheless, it is still difficult to make a correct diagnosis in some cases. The aim of this case study was to investigate the accuracy of T staging diagnosis in patients with CRC who underwent curative operations and to identify the causes of preoperative over-diagnosis.

**Method:** Medical charts of 1013 colorectal cancer patients who underwent a curative operation in the University of Tokyo Hospital between January 2011 and December 2016 were analyzed retrospectively. We defined a two-level or more difference between clinical and pathological T stages as over-diagnosis or under-diagnosis.

**Results:** Nine patients were over-diagnosed in T stage preoperatively. The rate of over-diagnosis was 0.9%. At least three main factors for over-diagnosis were identified: close-to-circumferential or obstructive lesion; a rough appearance in the adipose tissues around the tumor on CT; and a tumor with a depressed structure.

**Conclusions:** Clinical T stage is overestimated with a marked difference from pathological T stage in approximately 1% of CRC patients. Further progress in diagnostic modalities is required for more accurate staging.

### 1. Introduction

The accuracy of preoperative T staging is reported as 57–93% since the technology of imaging devices has developed [1–6]. In our hospital, we routinely perform colonoscopy, multidetector CT with three-dimensional angiography, and CT-colonography (CTC) or contrast enema for all patients with CRC [7,8]. With these image results, we diagnose the preoperative stage, which is used to determine the operative procedure. Nevertheless, the clinical and pathological diagnoses for the depth of tumor invasion (T stage) occasionally differ. In this study, we reviewed over 1000 CRC patients in our department. We report CRC patients who were over-diagnosed preoperatively and discuss what caused the over-diagnosis in T stage.

### 2. Materials and methods

We retrieved the medical records of 1013 consecutive patients with CRC who underwent curative operations in the University of Tokyo Hospital between January 2011 and December 2016. Patients treated with endoscopic submucosal dissection (ESD), endoscopic mucosal resection, neoadjuvant chemotherapy or radiation therapy, as well as recurrent cancer and rectal cancer below the peritoneal reflection were excluded from this analysis. The patients' clinical stages were diagnosed

at a multidisciplinary meeting by gastrointestinal surgeons and radiologists. Here we classified clinical and pathological T into five stages, namely Tis, T1, T2, T3 and T4, essentially based on the AJCC/TNM classification [9]. We defined a two-level or more difference between clinical and pathological T stages as over-diagnosis or under-diagnosis.

The study was conducted in accordance to Declaration of Helsinki for human research, registered under Research Registry (Researchregistry3406) and reported in line with the PROCESS criteria [10]. Written informed consent was obtained from the patients for publication of this article and any accompanying images.

### 3. Results

#### 3.1. General findings

The rate of over-diagnosis was 0.9% (9/1013) and the rate of under-diagnosis 1.2% (12/1013). Table 1 shows the correlation between clinical and pathological T stages in our study. Table 2 summarizes the details of the nine patients whose T stage was over-diagnosed preoperatively. They were staged by CT, colonoscopy, CTC, and/or contrast enema. When determining preoperative T stage, we generally pay attention to a rough appearance in the adipose tissues around the tumor on CT, intestinal wall deformities with CTC or contrast enema, and the

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**Table 1**  
Correlation between clinical and pathological T stages.

Clinical T stage	Pathological T stage					Total
	Tis	T1	T2	T3	T4	
Tis	5	2	0	0	0	7
T1	9	123	25	1	1	159
T2	2	40	73	79	11	205
T3	0	6	46	285	166	503
T4	1	0	0	55	83	139
Total	17	171	144	420	261	1013

**Table 2**  
Summary of the nine patients who exhibited a difference between clinical and pathological T stages.

Patients no., sex/age (y.o.)	Location	cT	pT	Methods of diagnosis	Major findings	Pattern
1. F/71	Descending colon	T3	T1	Colonoscopy, CT, CTC	100% circumference	A
2. F/69	Sigmoid colon	T4	Tis	Colonoscopy, CT, Contrast enema	100% circumference Raised CT density Many diverticula	A, B
3. F/83	Ascending colon	T3	T1	Colonoscopy, CT, CTC	50% circumference 37 mm in size	A
4. F/86	Sigmoid colon	T3	T1	Colonoscopy, CT, CTC	50% circumference Raised CT density 53 mm in size	A, B
5. F/80	Sigmoid colon	T3	T1	Colonoscopy, CT, CTC	Raised CT density	B
6. F/76	Ascending colon	T3	T1	Colonoscopy, CT, CTC	50% circumference 75 mm in size	A
7. F/75	Cecum	T3	T1	Colonoscopy, CT, CTC	Raised CT density	B
8. M/58	Rectosigmoid colon	T2	Tis	Colonoscopy, CT, Contrast enema	Tumor with depression	C
9. M/69	Sigmoid colon	T2	Tis	Colonoscopy, CT, CTC	Tumor with depression 35 mm in size	C

yo., years old; cT, clinical T; CTC, CT colonography; F, female; M, male; pT, pathological T.

circumferential extent and structure of the tumor with colonoscopy. At least three reasons for the over-diagnosis were identified. The first was a close-to-circumferential or obstructive lesion revealed by colonoscopy and/or CTC or contrast enema (Pattern A). Five patents showed Pattern A; all of them were diagnosed with preoperative T3 and turned out to have pathological T1 stage. The second was a rough appearance in the adipose tissues around the tumor on CT (Pattern B). Four patents showed Pattern B; all of them were diagnosed with preoperative T3 and turned out to have pathological Tis or T1. Two patents had both Pattern A and B. The third reason was a protruding tumor with depressed structure (Pattern C). Two patients showed Pattern C with clinical T2 cancer, who were then pathologically diagnosed with Tis.

3.2. Case presentation

We first present a representative case of Pattern A (Case 1). A 71-year-old woman underwent ESD for early colon cancer in the transverse colon. A follow-up colonoscopy after a 3-year interval revealed severe

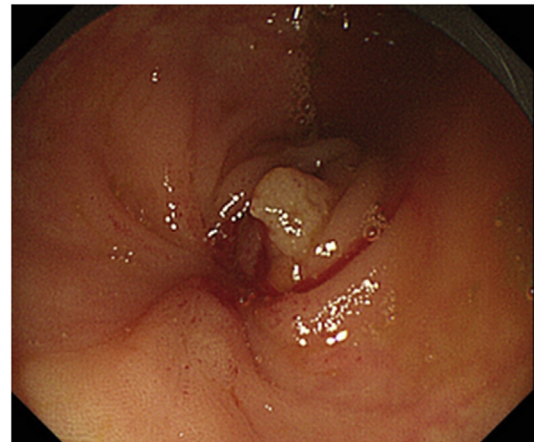


Fig. 1. Colonoscopy shows a bowel obstruction at the descending colon in Case 1.

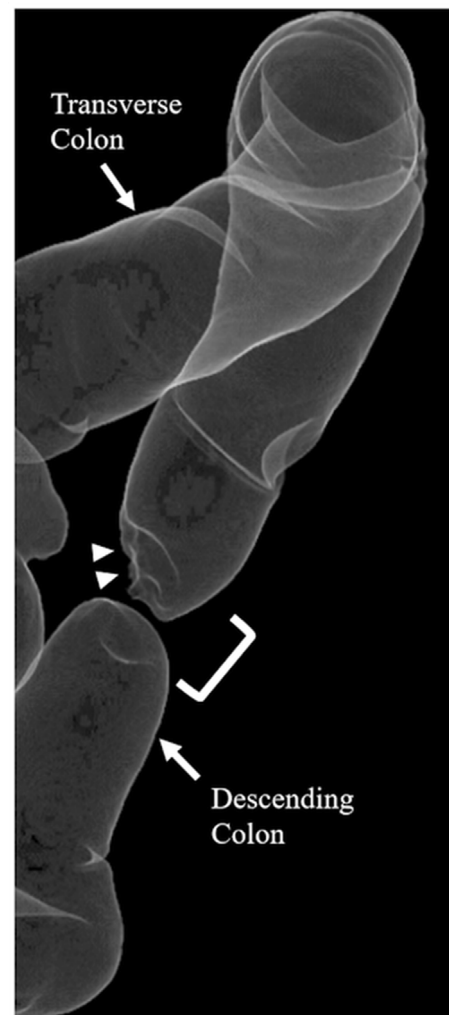


Fig. 2. CTC shows severe narrowing in the descending colon (bracket) and a wall deformity at the oral side (arrowheads) (Case 1).

narrowing at the descending colon but the appearance of the mucosa looked normal in the region (Fig. 1). CTC revealed a bowel obstruction at the descending colon near the splenic flexure and a wall deformity at the oral side of the bowel obstruction (Fig. 2). There was no rough appearance in the adipose tissues around the tumor on CT. The patient

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