Supplementary Table 1 Admission criteria and Exclusion criteria

Admission criteria	Exclusion criteria
• Fully understand this study and voluntarily sign the informed consent form; willing and able to comply with the study protocol during the study period • Pathologically confirmed rectal adenocarcinoma (non-special type and special type, including mucinous adenocarcinoma, signet ring cell carcinoma, serrated adenocarcinoma, micropapillary carcinoma, medullary carcinoma, cribriform comedonal adenocarcinoma); preoperative imaging confirmed that the stage is 1) rectal cancer T3 and (or) N+ resectable rectal cancer patients, 2) for T4 patients, reassessment of resection is required after the completion of neoadjuvant therapy. • Age ≥ 18 years old, gender is not limited, ECOG score 0-2 points;	• Presence of Metastasis: Distant metastasis or peritoneal metastasis confirmed by laparoscopy. • Involved mesorectal fascia • Concurrent Immunosuppression or Malignancy: Other severe immunosuppressive diseases or concurrent other malignancies. • History of Other Malignancy: Diagnosis of malignancy at another site within the past 5 years (except adequately treated basal cell carcinoma of the skin, squamous cell carcinoma of the skin, or carcinoma *in situ* of the cervix). • Pregnancy or Lactation: Patients who are pregnant or lactating. • Impaired Capecitabine Absorption: Any condition affecting the intestinal absorption of capecitabine.

- Physical condition and organ function allow for major abdominal surgery;
- Agree that the researchers use blood, stool and pathological sections for research during the study;
- The main organ function meets the following requirements (laboratory test values within 7 days before enrollment must meet the following standards)
  - Routine blood examination: (no blood transfusion, no use of granulocyte colony stimulating factor, no use of drug correction within 14 days before screening): Neutrophil ≥ 1.5×109/L; Platelet ≥ 75×109/L; Hemoglobin ≥ 90g/L;
  - Biochemical examination: (no albumin transfusion within 14 days before screening): Serum creatinine ≤ 1.5× upper limit of normal (ULN), or creatinine

- Investigator's Judgment: Any other comorbidities deemed by the investigator to potentially compromise patient safety or affect study completion.
- Prior Investigational or Immunotherapy: Current or previous treatment with any investigational drug or immunotherapy.
- Uncontrolled Comorbidities:
  - Severe, uncontrolled recurrent infections.
  - Other severe, uncontrolled concomitant diseases.
  - Severe psychiatric illness.
  - Severe respiratory disease.
  - Severe hepatic or renal insufficiency.
  - History of unstable angina or myocardial infarction within the past 6 months.
  - History of cerebral infarction or cerebral hemorrhage within the past 6 months.

clearance > 50 mL/min; Serum total bilirubin ≤ 1.5×ULN; Aspartate aminotransferase (AST), alanine aminotransferase (ALT) ≤2.5×ULN; ▪ Coagulation function: a) International normalized ratio (INR) ≤2.3 or prothrombin time (PT) exceeds the normal control range ≤6 seconds.	▪ Continuous systemic corticosteroid therapy within the past 1 month (excluding topical application).

ECOG score; Eastern Cooperative Oncology Group Performance Status score.

Supplementary Table 2 Adverse events after surgery

Treatment-related adverse events	Grade I-II [n (%)]	≥Grade III [n (%)]	All grade [n (%)]
Postoperative complications			
Abdominal pain	11 (26.8%)	0 (0%)	11 (26.8%)
Incisional infection	0 (0%)	1 (2.4%)	1 (2.4%)
Anastomotic leakage	2 (4.9%)	1 (2.4%)	3 (7.3%)
Intestinal obstruction	2 (4.9%)	0 (0%)	2 (4.9%)
Dysuria	1 (2.4%)	0 (0%)	1 (2.4%)
Rectovaginal fistula	0 (0%)	1 (2.4%)	1 (2.4%)
Necrosis of colon	1 (2.4%)	0 (0%)	1 (2.4%)
Total	11 (26.8%)	3 (7.3%)	14 (34.1%)

Supplementary Table 3 Univariable logistic regression analysis of clinical risk assessment factors

Characteristic	p	OR	95%CI
Age (> 60Y)	0.245	0.421	0.091-1.78
Gender (female)	0.408	1.8	0.446-7.58
BMI before treatment(> 24)	0.06	3.54	0.979-14.0
Hypertension(positive)	0.923	0.938	0.247-3.45
Diabetes(positive)	0.274	0.279	0.014-2.12
Smoke (positive)	0.787	1.19	0.327-4.34
Drink alcohol(positive)	0.473	0.567	0.105-2.55
Distance from anal verge(> 5cm)	0.732	0.804	0.227-2.83
CRM(threatened)	0.063	5.25	1.03-39.9
EMVI (positive)	0.656	1.38	0.323-5.97
Tumor size(> 4cm)	0.004	9.37	2.29-50.1
Neutrophils / lymphocytes after treatment(> 2.2)	0.51	1.54	0.433-5.77
Neutrophils / lymphocytes before treatment (> 2.2)	0.166	2.44	0.703-9.02
Before treatment CEA (>5ng/ml)	0.025	0.183	0.035-0.740

BMI , Body mass index; CRM, Circumferential Resection Margin; EMVI, Extramural Vascular Invasion.