



Contents lists available at ScienceDirect

European Journal of Surgical Oncology

journal homepage: [www.ejso.com](http://www.ejso.com)

## Metastasis to the rectum: A systematic review of the literature

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### ARTICLE INFO

#### Article history:

Received 16 August 2021

Accepted 7 October 2021

Available online xxx

#### Keywords:

Cancer  
Secondary tumor  
Malignancy

### ABSTRACT

**Background:** Metastatic spread to the rectum is a rare finding, and management of rectal metastases (RM) is not standardized. The aim of the present study was to review the evidence on diagnosis, management and outcomes of RM.

**Methods:** A computerized literature search through MEDLINE/PubMed, Embase and the Cochrane databases was performed, applying a combination of terms related to RM. Articles and abstracts were screened and final selection was done after cross-referencing and by use of predefined eligibility criteria. **Results:** Final analysis was based on 99 publications totaling 162 patients with RM from 16 different primary tumors. Most common origins of RM were breast (42 patients), stomach (38 patients), and prostate (16 patients). RM occurred metachronously in the majority of patients (77%). The main treatment was surgical resection (n = 32), followed by chemotherapy (n = 16). Median overall survival for breast RM, stomach RM, and prostate RM were 24 months (95% CI 9–39 months), 7 months (95% CI 0–14 months), and 24 months (95% CI 7–41 months), respectively.

**Conclusion:** RM is a rare and highly heterogeneous condition. Surgical treatment appears to be a valuable treatment option in selected patients, while overall prognosis depends mainly on the primary tumor.

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## 1. Introduction

Metastases to the gastrointestinal tract are rare. Overall, incidence of metastases to the upper and lower gastrointestinal tract is 0.03% and 0.05% of all metastases, respectively [1]. In the limited literature, gastrointestinal metastases are treated mostly as one group. However, management, treatment and prognosis vary considerably according to the metastatic site and the underlying primary tumor.

Metastases to the rectum are particularly rare and its true incidence is unknown. Tumoral invasion of the rectum by a metastasis carries specific risks, such as obstruction or perforation [2,3]. Moreover, due to the anatomical position of the rectum and its proximity to other structures (prostate, bladder, uterus), rectal metastases (RM) can induce various symptoms, be non-resectable, or create functional problems. Lastly, surgical resection is more complex than other intestinal resections and stoma creation might

be required. The specificity and clinical implications of RM underline the relevance and interest of a comprehensive review of the available evidence on this uncommon pathology.

The aim of the present study was to systematically review the literature on RM from various etiologies, in terms of diagnosis, treatment and outcomes.

## 2. Methods

### 2.1. Search

A computerized literature search was performed through MEDLINE/PubMed, Embase and the Cochrane databases, applying the following terms: “neoplasm metastasis” (MeSH term), “rectum” (MeSH term), “rectal metastasis” (free text), “rectal metastases” (free text), and “secondary neoplasm” (free text). These terms were combined using “AND” and “OR”. Additional articles and abstracts were identified by cross-referencing. Only articles published in English language from implementation of above-cited databases until December 2020 were considered for the present review.

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<https://doi.org/10.1016/j.ejso.2021.10.004>

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## 2.2. Eligibility criteria

Hematogenous, lymphogenic or seeding RM (distant metastases) were considered whereas direct tumoral invasion into the rectum was an exclusion criterion. Only full-text articles were included. Letters to the editor, posters, and clinical images were excluded.

## 2.3. Data extraction

The following data were extracted: sex, age, RM clinical presentation, RM diagnostic procedures, site of primary tumor, histology and treatment of primary tumor, synchronous or metachronous RM (if metachronous, time between primary tumor diagnosis and RM diagnosis), presence of other metastases, RM treatment, overall survival from RM discovery, and specific markers.

## 2.4. Statistics

Continuous variables were presented as median with interquartile range and categorical variables as proportion and percentage. The Kaplan-Meier method was used to calculate the overall survival (OS). OS was reported as median with 95% confidence interval (CI). SPSS Statistics for Mac OS X, version 25 (IBM Corp., Armonk, NY, USA) was used for all statistical analyses.

As no direct patient data were used, approval of the ethics commission was waived. This systematic review was conducted and reported following the PRISMA guidelines.

## 3. Results

### 3.1. Overall results

A total of 722 publications was identified and after duplicate removal, 99 articles were finally included totaling 162 patients with RM (70 women, 50 men and 42 cases with no gender precision) [2–10]. Summary of the search is shown in the PRISMA flowchart (Fig. 1). Median age was 65 years (IQR 35–85). Breast cancer was the most common origin of RM (42 patients), followed by gastric cancer (38 patients), prostate cancer (16 patients), and melanoma (14 patients). Results are presented below according to the origin of the primary tumor.

The main treatment performed was resection surgery ( $n = 32$ , abdominoperineal resections, anterior low resections, Hartmann's operations, or total pelvic exenterations), sometimes combined with stoma ( $n = 8$ ), with ( $n = 15$ ) or without ( $n = 25$ ) neoadjuvant or adjuvant therapy. Chemotherapy (ChT) alone was the second most used treatment ( $n = 16$ ). Stoma alone was performed in 9 patients, as well as in 5 patients with neoadjuvant or adjuvant therapy. Table 1 summarizes the number of patients, the resection rates and the survival ranges based on the origin of the primary tumor. Survival curves of patients with RM from urogenital, gynecologic, and gastrointestinal origins are shown in Fig. 2.

### 3.2. Urogenital cancers ( $n = 38$ )

Median age of the 16 patients with prostate cancer was 73 years (IQR 69–85) [2–10]. Six patients had other metastases in addition to RM. Median OS was 24 months (95% CI 7–41). Three of 11 patients did not receive any therapy for the RM, whereas the rest underwent

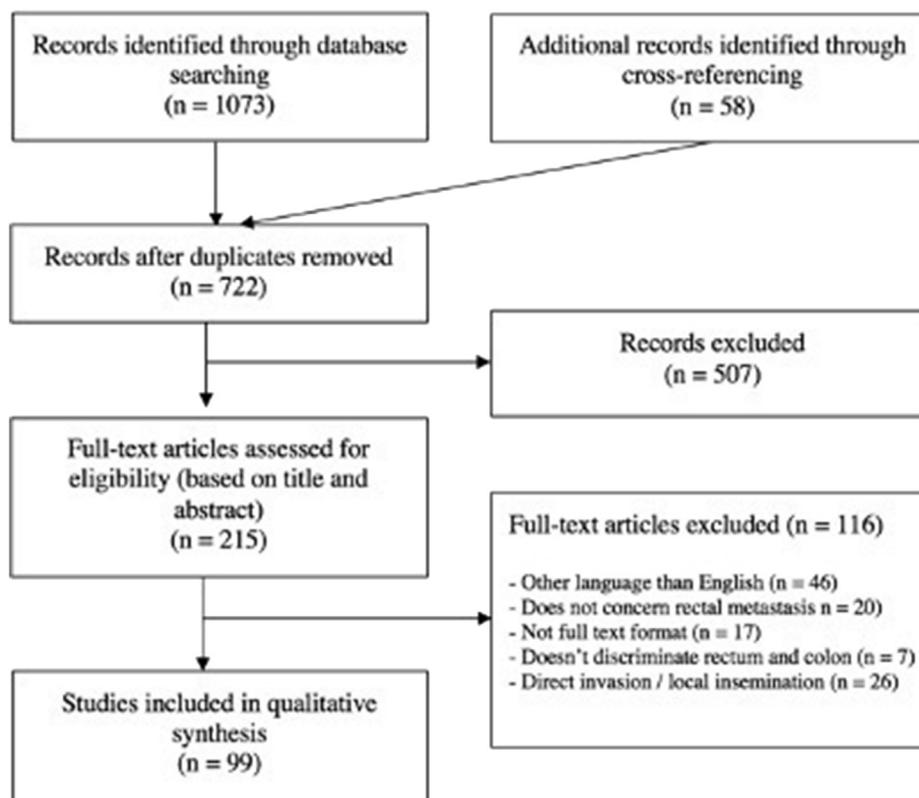


Fig. 1. PRISMA flowchart of the study.

surgical treatment (4 colostomy, 1 abdominoperineal resection, 1 nodule excision, 1 castration, 1 sigmoid resection). Regarding bladder cancer, median age of affected individuals ( $n = 13$ , 3 had other metastases) was 62 (IQR 54–73), and all patients were male [11–18]. Concerning the RM therapy, 2/3 of the patients with a known treatment ( $n = 9$ ) underwent only ChT and 1/3 underwent surgical treatment (1 colostomy, 1 rectal resection, 1 total exenteration) combined with ChT and/or radiotherapy (RT). OS was only mentioned for 3 patients (range: 2–8 months). Of note, all RM prostate and bladder cancers were true distant metastases and not direct tumoral invasion of the rectum by the primary tumor. Four studies were included for kidney cancer and 1 for seminal vesicles [19–23]. All 4 patients with kidney cancer RM had metastases in other organs and underwent different types of RM treatment (including RT, endoscopic resection, abdominoperineal resection, and Sunitinib). OS was specified for all patients, ranging from 3 to 18 months. Table 2 summarizes the findings of included studies regarding urogenital cancers.

### 3.3. Gynecologic cancers ( $n = 51$ )

For the breast group, median age was 60 years (IQR 38–82) and median OS 24 months (95% CI 9–39) [9,17,18,24–58]. Median OS in the surgical vs. non-surgical RM treatment groups were 26 (95% CI 6–46) and 16 months (95% CI 9–23). Median age for the ovarian

cancer group was 57 years (IQR 35–70), which represents the youngest group in this study [16,24,59–63]. Two patients did not have any other metastases at the time of RM occurrence and 2 had peritoneal carcinosis. Regarding endometrium cancer, both patients underwent surgery completed with RT for the primary cancer and for the RM (Hartmann's procedure and low anterior resection). One patient died 11 month later and the other one was still alive 5 years after RM diagnosis. Findings regarding gynecologic cancers are summarized in Table 3 and Supplementary Table 1.

### 3.4. Melanoma ( $n = 15$ )

RM treatment was specified in only 4 out of 15 patients [17,64–70]. Three had abdominoperineal resection and 1 had argon plasma coagulation and immunotherapy. As a particularity, it is the only group where anemia was described as clinical presentation of RM. Supplementary Table 2 summarizes the findings of included studies regarding melanomas.

### 3.5. Pancreas and liver cancers ( $n = 5$ )

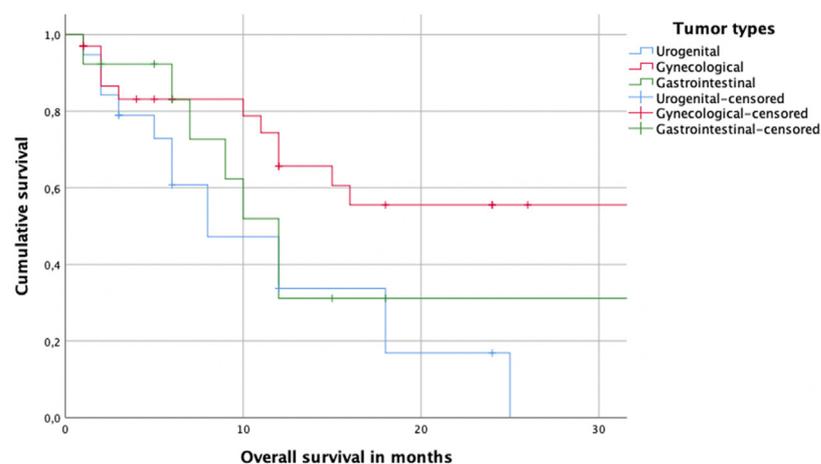
Median age of the 5 patients was 68 (IQR 38–87) [71–75]. In 3 patients, RM were discovered synchronously as the primary cancer. Only 2 patients had data on OS (alive at 12 months and dead at 19 months). Summary of the data found for pancreas and liver cancer

**Table 1**

Summary table based on the origins of the rectal metastases.

Origin of rectal metastases	Number of patients	Resection rate	Survival (range)
Urogenital	38	7/35	1 week–2 years
Gynecological	51	16/45	1 month–5 years
Melanoma	15	3/4	26 months <sup>a</sup>
Pancreas and liver	5	3/5	12–19 months
Gastrointestinal	44	9/22	1 month–36 months
Lung	10	2/5	5 weeks–20 months
Others (nasopharynx and femoral bone)	3	2/3	15 days–1 month

<sup>a</sup> Only one patient had data on survival time.



#### Patients at risk

Urogenital	19	6	1	0
Gynecological	33	18	9	6
Gastrointestinal	13	5	1	1

**Fig. 2.** Kaplan-Meier curves for overall survival of patients with rectal metastases from urogenital, gynecological and gastrointestinal tumors. Median overall survivals with 95% confidence intervals: 8 months (3–13) vs. 48 months (1–121) vs. 12 months (9–15),  $p = 0.014$  (log-rank). Tumor types with <10 patients with data on overall survival were not included in this graph.

**Table 2**  
Studies reporting rectal metastases (RM) from urogenital cancers.

First author	N° cases	Age	Sex	Site of primary tumor	Histology type of primary	Treatment of primary	Clinical presentation of RM	Syn or Met RM	Time between primary and RM	Diagnostic procedures	Other metastases	Treatments of RM	Overall survival*
Abbas [2].	1	60	M	Prostate	Prostate adenocarcinoma	HT	Rectal bleeding, vomiting	Syn	N/A	Colonoscopy	Bone	N/S	N/S
Culkin [3]	6	73 (mean age)	M	Prostate	Poorly differentiated prostate "cancer"	N/S	Bowel obstruction	Syn	NA	Barium enema	Liver	Sigmoid resection	18 months
			M	Prostate				Syn	NA	Barium enema	None	APR	25 months
			M	Prostate				Met	N/S	Barium enema, CT	Bone	None	2 months
			M	Prostate				Met	N/S	Barium enema, CT	None	None	6 months
			M	Prostate				Met	N/S	Barium enema	Bone, liver	Colostomy	<1 week
			M	Prostate				Met	N/S	Barium enema, CT	Bone, liver	Colostomy	5 months
Zhi Hua Liu [4]	1	73	M	Prostate	Poorly differentiated adenocarcinoma	Bilateral surgical orchiectomy, Casodex	Altered bowel habits, hematochezia	Met	6 years	PR, enteroscopy, CT, MRI	N/S	None (neo. ChT and surgery considered)	N/S
Nwankwo [5]	1	69	M	Prostate	Poorly differentiated adenocarcinoma	RT, bilateral orchiectomy, Flutamide, prostate cryoablation	Rectal bleeding, lower abdominal pain	Syn	14 days	Colonoscopy	N/S	N/S	N/S
Venara [6]	1	75	M	Prostate	Prostate adenocarcinoma	Radical prostatectomy, HT	Abdominal pain	Met	20 years	MRI, rectoscopy	N/S	LAR, colostomy	Alive at 1 year
Winter [7]	3	65	M	Prostate	Prostate adenocarcinoma	Castration, oral estrogen	Weight loss	Syn	NA	Barium enema	Generalized metastasis	Castration, oral estrogen	1 year
		N/S	M	Prostate	N/S								
		N/S	M	Prostate	N/S								
You [8]	1	78	M	Prostate	"Prostate cancer"	Luphere Depot	Constipation, thinning of stool caliber	Syn	N/A	Sigmoidoscopy, CT, MRI, PET-CT	N/S	Colostomy	Alive at 2 years
Dumontier [9]	1	85	M	Prostate	N/S			Met	2 years	Rectal enema, EUS	N/S	N/S	3 months
Vaghefi [10]	1	69	M	Prostate	Moderately differentiated adenocarcinoma	Radical prostatectomy	Asymptomatic	Met	5 years	Rectosigmoidoscopy, EUS, coloscopy	None	"Nodule excision"	Alive "several months" later
Hashash [11]	1	55	M	Bladder	Urothelial carcinoma	Neo. ChT, RCP and ileal loop urinary diversion	Rectal pain, urgency	Met	10 months	CT, colonoscopy, EUS	Pelvis	Colostomy, ChT, palliative RT	N/S
Katsinelos [12]	1	68	M	Bladder	Papillary transitional cell carcinoma	RC	Constipation, tenesmus	Syn	N/A	Endoscopy, MRI	Peritoneum	APR, adj. RT, adj. ChT	8 months
Langenstroer [13]	1	73	M	Bladder	Poorly differentiated cell carcinoma	RCP and ileal loop urinary diversion	Rectal pain, weight loss, diarrhea	Met	3 years	CT, laparoscopic exploration	N/S	Palliative ChT	2 months
Yang [14]	1	61	M	Bladder	Urothelial carcinoma	Neo. ChT, RC, adj. ChT	Abdominal distension	Syn	1 month	CT, colonoscopy	None	ChT	Alive at 3 months
Yusuf [15]	2	54	M	Bladder	Transitional cell bladder cancer	RC and ileal neobladder reconstruction	Change in bowel habit	Met	2 years	Sigmoidoscopy, MRI, EUS	None	ChT	N/S
		73	M	Bladder	Transitional cell bladder cancer	RC and ileal neobladder reconstruction	Constipation	Met	2 years	Sigmoidoscopy, MRI, EUS	Pelvis	Total pelvic exenteration, ChT	N/S
Ha [16]	1	N/S		Bladder	Transitional cell bladder cancer	N/S							
Gleeson [17]	3	54	M	Bladder	Grade 3 transitional cell of the bladder	RCP with neobladder	Hematochezia	N/S	N/S	Colonoscopy, MRI, EUS	N/S	ChT	N/S
		55	M	Bladder	Grade 3 transitional cell of the bladder	RCP with neobladder	Constipation			Colonoscopy, CT, EUS	N/S	ChT	N/S
		60	M	Bladder	Grade 3 transitional cell of the bladder	RCP with neobladder	Constipation			Colonoscopy, CT, EUS	N/S	ChT	N/S
Wei [18]	3	N/S	N/S	Bladder	Transitional cell bladder cancer	N/S							
Wang [19]	1	54	M	Seminal vesicles	Squamous cell carcinoma	"Tumor removal"	N/S	Met	7 months	N/S	N/S	None	1 year
Dellon [20]	1	70	M	Kidney	Renal cell carcinoma	Radical nephrectomy	Asymptomatic	Met	26 years	Colonoscopy, EUS	Brain, lung	RT	8 months
Ouellet [21]	1	78	F	Kidney		Radical nephrectomy		Syn	N/A	Colonoscopy, CT	Vagina		6 months

Rosito [22]	1	55	M	Kidney	Renal clear cell carcinoma	Radical nephrectomy	Painless hematochezia Anal bleeding	Met	9 months	Colonoscopy, CT, Chest X-Ray	Bone, lung	Removal during colonoscopy	18 months
Zheng [23]	1	65	M	Kidney	Renal clear cell carcinoma	Radical nephrectomy, adj. ChT	N/S	Met	8 years	Colonoscopy, PET-CT	Lungs	Abdominoperineal resection Sumitimb	Alive at 3 months

APR = Abdominoperineal resection, ChT = Chemotherapy, HT = Hormonotherapy, RT = Radiotherapy, Neo. = Neoadjuvant, Adj. = Adjuvant, N/S = Not specified, N/A = Not applicable, Met = Metastatic, Syn = Synchronous, \* (from metastasis discovery).

RM are shown in [Supplementary Table 3](#).

### 3.6. Gastrointestinal cancers (n = 44)

Median age was 60 years (IQR 39-74). RM therapy was described for 17 patients. About 2/3 (n = 12) had palliative ChT and/or RT whereas 1/3 (n = 5) had surgical removal. Median OS (ChT and surgical treatments taken together) was 7 months (95% CI 0-14). Regarding colon cancer, 5 cases were included (4 men) [16,88-91]. All patients received surgical therapy (2 peritoneal resections, 1 low anterior resection and 1 Hartmann's operation) with OS ranging from 12 to 60 months. [Table 4](#) summarizes the findings of studies regarding gastrointestinal cancers.

### 3.7. Lung cancer (n = 10)

Median age was 62 years (IQR 41-81) and 80% of the patients were male [92-97]. Survival after RM occurrence ranged from 5 weeks to 20 months. [Supplementary Table 4](#) summarizes the findings of included studies regarding lung cancer.

### 3.8. Others (nasopharynx and femoral bone cancers) (n = 3)

OS of patients with nasopharynx RM appeared to be very short [98,99]. One of the patients underwent an unspecified surgical treatment and died 15 days later whereas the other one did not receive any treatment and survived 1 month. Hayasaka et al. described the only case of RM from fibrous histiocytoma of the femoral bone found in the literature [100]. The patient did not have other metastases and underwent tumorectomy. Survival report was not specified. [Supplementary Table 5](#) summarizes the findings of included studies regarding nasopharynx and femoral bone cancers.

## 4. Discussion

RM is a rare condition with challenging management. Treatment and prognosis mainly depend on the underlying primary and global disease extent. Surgical resection entails favorable outcomes in selected patients.

Regarding gastrointestinal metastases, symptoms are generally aspecific (bleeding, abdominal pain) or even absent. However, gastrointestinal bleeding is most often present as the majority of gastrointestinal metastases are located in the stomach and duodenum [16]. The best diagnostic method remains endoscopy with biopsy [16]. Even though gastrointestinal metastases are often associated with an advanced stage of the disease, aggressive treatment with chemotherapy and/or surgery allow better results in terms of symptom relief and survival prolongation than conservative palliative treatment [16]. Overall prognosis is poor but depends on the patient condition, the origin of the primary tumor and the presence of other metastases.

Decision to perform surgery for RM should consider several important factors: patient desire, presence of symptoms decreasing the quality of life, life expectancy, treatment alternative, and origin of the primary tumor. Resection surgery should be performed to improve the quality of life and prevent complications in patients with a good overall health status with at least several months of life expectancy.

As RM is a rare phenomenon, its precise incidence is unknown. Patient reported outcomes, quality of life after surgery (after resection or stoma), complications of RM treatment are important elements that are not described in the literature.

Surgery is currently recognized as the main treatment in gastrointestinal metastases from melanoma, showing consistently better survival rates than systemic therapies, even for patients with

**Table 3**  
Studies reporting rectal metastases (RM) from gynecologic cancers (breast).

First author	N° cases	Age	Sex	Histology of primary	Treatment of primary	Clinical presentation of RM	Syn or Met RM	Time between primary and RM	Diagnostic procedures	Other metastases	Treatments of RM	Overall survival*	ER/ PGR	HER
Bailey [24]	1	36	F	LC	Tamoxifen and chemotherapy	CBH	Syn	N/A	CT, endoscopy	Meninges	HT, ChT	4 months	N/S	
Dumontier [9]	3	52	F	N/S			Met	2 years	Rectal enema, Rectosigmoidoscopy, EUS	N/S		Alive at 12 months	N/S	
		76	F				Met	3 years	Rectal enema, Rectosigmoidoscopy, EUS			Alive at 16 months		
		60	F				Met	3 years	Rectal enema, Rectosigmoidoscopy, EUS			6 months		
Ambroggi [25]	1	40	F	DC, SRC	Epirubicin, Docetaxel, Tamoxifen, LH-RH analogue	RB	Syn	N/A	Colonoscopy, Chest X-ray, abd. US	None	HT, RT	Alive at 4 years	Pos/ Neg	Neg
Amin [26]	1	61	F	LC	Tamoxifen, Letrozole	CBH, fecal urgency	Met	17 years	Colonoscopy, CT, MRI	None	Hartmann's proc.	Alive at 5 months	Pos/ Neg	Neg
Arrangoiz [27]	1	70	F	LC	Paclitaxel, Bevacizumab, Zoledronic	Reduced stool caliber, flatulence, diarrhea	Syn	N/A	Colonoscopy, CT, MRI	Stomach, liver, left lung, peritoneum, bone	Colostomy	Alive at 12 months	Pos/ Neg	Neg
Asch [28]	2	58	F	N/S		Const. rectal mass	Met	6.5 years	N/S		Colostomy	2 months	N/S	
		75	F			Nausea, const., rectal mass	Met	1,5 years			Colostomy	<1 month		
Balja [29]	1	83	F	LC, SRC	Mastectomy, ALND, RT, HT	Const.	Met	8 years	X-ray, endoscopy, CT	None	APR, HT	Alive at 6 months	Pos/ Pos	N/S
Balthazar [30]	1	65	F	N/S		Const., tenesmus	N/S		Endoscopy	N/S				
Bamias [31]	1	74	F	LC, SRC	Right mastectomy, ChT, HT	Const., tenesmus	Met	9 years	CT, endoscopy, exploratory laparotomy	Bone, pelvis, peritoneum, uterus, bladder	ChT, colostomy	Alive at 6 months	Pos/ Pos	N/S
Bar-Zohar [32]	1	68	F	DC	MRM, CT, HT	Const., tenesmus, abd. pain	Met	6 years	CT, colonoscopy	N/S	ChT, RT	N/S	Pos/ Neg	N/S
Cervi [33]	1	59	F	LC	Modified radical mastectomy	RB, incontinence, tenesmus	Met	8 years	CT, rectosigmoidoscopy	Peritoneum	APR	N/S	Pos/ Pos	N/S
Cherian [34]	1	79	F	DC	Mastectomy	CBH, anal pain, weight loss	Met	10 years	CT, colonoscopy	None	HT	3 months	N/S	N/S
Clavien [35]	1	82	F	LC	Mastectomy	Diarrhea	Syn	N/A	US, CT, barium meal, BE	None	HT	Alive at 18 months	Pos/ N.S.	N/S
Efthimiadis [36]	1	74	F	LC	Quadrantectomy, ALND, ChT	Const., abdominal pain	Met	5 years	CT, IRM, anoscopy	None	APR, RT	Alive at 1 month	Neg/ Neg	N/S
Eljabu [37]	1	70	F	LC	Mastectomy, RT, HT	Abdominal pain, const.	Met	2 years	CT, sigmoidoscopy	Small bowel	HT	N/S	Pos/ Neg	Neg
Elsaify [38]	1	61	F	LC	Mastectomy, HT	CBH	Met	19 years	CT, MRI	None	LAR, ChT, HT	Alive at 3 years	Pos/ Pos	Neg
Franceschini [39]	1	67	F	LC	Mastectomy, ALND, CT, HT	RB, tenesmus, const.	Met	15 years	CT, rectosigmoidoscopy	Pelvis	ChT, HT	N/S	Pos/ Pos	Pos
Gerova [40]	1	56	F	LC	MRM, RT, ChT, HT	RB, tenesmus, abd. pain	Met	5 years	Colonoscopy, EUS	Stomach	Palliative care	10 months	N.S./ Pos	N/S
Guzman-Calderon [41]	1	65	F	LC	Radical mastectomy, ALND, HT	RB	Met	3 years	CT, MRI, colonoscopy	None	N/S	N/S	Pos/ Pos	Neg
Ikeda [42]	1	64	M	DC	Mastectomy, HT	RB	Met	3 years	BE, CT	Liver	HT	Alive at < 1 month	Pos/ Neg	N/S
Klein [43]	1	77	F	N/S	Mastectomy, RT	RB	Met	23 years	Sigmoidoscopy BE	Peritoneum, stomach	RT	Alive at < 1 month	N/S	N/S
Laoutliev [44]	1	57	F	LC	Mastectomy, RT, HT	Constipation	Met	N/S	Colonoscopy, EUS, MRI, PET-CT	Omentum	Colostomy, LAR, RT, HT	N/S	Pos/ N.S.	N/S
Li Ching Lau [45]	1	61	F	LC	Mastectomy, HT	Diarrhea, mucous in stool, Back pain	Met	11 years	Colonoscopy, CT	None	Colostomy, RT, HT	Alive at 2 years	Pos/ Pos	N/S
	1	67	F	LC, SRC			Met	15 years	Colonoscopy, CT	Bone	N/S	2 months		N/S



**Table 4**  
Studies reporting rectal metastases (RM) from gastrointestinal cancers.

First author	N° cases	Age	Sex	Site of primary	Histology type of primary	Treatment of primary	Syn or Met RM	Time between primary and RM	Clinical presentation of RM	Diagnostic procedure for RM	Other metastases	Treatments of RM	Overall survival*
Dumontier [9]	6	74	F	Stomach	N/S		Syn	N/A	N/S	Rectal enema, rectosigmoidoscopy, EUS	N/S	ChT, RT	10 months Alive at 7 months 15 months 36 months "Short follow-up" "Short follow-up"
		59	F	Stomach		Met	6 years						
		62	M	Stomach		Met	3 years						
		69	M	Stomach		Met	1 year						
		45	F	Stomach		Met	10 years						
Balthazar [30]	2	72	F	Stomach	N/S				Dysphagia, abdominal mass, weight loss	Endoscopy	N/S		
		61	M	Stomach					Constipation, rectal bleeding	Endoscopy			
Derici [76]	1	39	F	Stomach	N/S		Syn	N/A	Dyspepsia, abdominal discomfort, constipation	Sigmoidoscopy, CT, explorative laparotomy	Mesocolon, both ovaries	Hartmann's procedure, adj. ChT	5,5 months
Dogan [77]	1	53	F	Stomach	Adenocarcinoma	Total gastrectomy	Met	3,5 years	Abdominal pain, tenesmus, weight loss	Sigmoidoscopy, CT, PET-CT	None	LAR, TME	<1 month
Epskamp [78]	1	70	F	Duodenum	Adenocarcinoma of the duodenum	Whipple procedure	Met	1 year	Abdominal, rectal blood loss, constipation	CT, rectal endoscopy	Hepatoduodenal ligament	Palliative ChT	N/S
Eriksen [79]	1	52	F	Stomach	"Carcinoma"	Sub-total gastrectomy	Met	2 years	Constipation, abdominal discomfort	Barium enema, visual assessment"	None	APR	N/S
Hamada [80]	1	47	M	Stomach	Poorly dif. adenocarcinoma	Sub-total gastrectomy	Met	N/S	Asymptomatic	CT, Colonoscopy	None	N/S	N/S
Lim [81]	1	43	F	Stomach	Poorly dif. adenocarcinoma	Radical total gastrectomy	Met	34 months	Constipation	Colonoscopy, CT, MRI, PET-CT	None	LAR, TME, ChT	Alive at 2 months
Makker [82]	1	60	F	Stomach	"Gastroesophageal carcinoma"	ChT	Syn	N/S	Asymptomatic	Sigmoidoscopy, EUS	Bone, lungs, pleura	Palliative ChT	12 months
Okugawa [83]	1	47	F	Stomach	Signet ring cell carcinoma	Gastrectomy, ChT	Met	18 months	Constipation	CT, endoscopy	Peritoneum	Rectal stent, ChT	9 months
Ponte [84]	1	51	M	Stomach	N/S		Met	4 years	Abdominal pain, constipation, vomiting	CT, sigmoidoscopy	None	N/S	
Tariq [85]	1	61	F	Stomach	Adenocarcinoma, signet ring cell	Palliative ChT	Syn	N/A	Abdominal pain, bowel obstruction	CT, sigmoidoscopy, EUS	Peritoneum	Palliative ChT	"Short follow-up"
Tural [86]	1	74	F	Stomach	Well dif. adenocarcinoma	Palliative ChT	Syn	N/A	Abdominal pain, bowel obstruction	CT, colonoscopy	None	Palliative ChT	"Short follow-up"
Uemura [87]	1	60	M	Stomach	Well dif. adenocarcinoma		Met	2 years	Asymptomatic	Colonoscopy, PET, CT	None	Laparoscopic LAR	

Author	Year	Sex	Age	Primary Cancer	RM Description	Endoscopic dissection, proximal gastrectomy	Surgery, adj. ChT, adj. RT	Met	Time	Complication	Imaging	Procedure	Survival
Ha [16]	18	N/S		Stomach	11 poorly differentiated, 4 signet ring cell, 1 well differentiated, 1 moderately differentiated, 1 mucinous	N/S	Surgery, adj. ChT, adj. RT	N/S		Constipation	CT, EUS	Stent	Alive at 6 months
Gleeson [17]	1	52 F		Stomach	Signet-ring adenocarcinoma	N/S	Surgery, adj. ChT, adj. RT	N/S					N/S
Kalaitzis [88]	1	72 F		Sigmoid Colon	Adenocarcinoma	Met	Sigmoidectomy	Met	1 year	Asymptomatic	CT, colonoscopy, EUS	APR	N/S
Kojima [89]	1	65 F		Transverse colon	Adenocarcinoma	Met	Laparoscopic hemicolectomy	Met	15 months	Asymptomatic	CT, colonoscopy	Laparoscopic LAR, adj. ChT	Alive at 18 months
Lucke-Wold [90]	1	56 M		Ascending colon	Mucinous adenocarcinoma	Met	Right hemicolectomy, adj. ChT	Met	3 years	Hematochezia	Sigmoidoscopy, PET-CT	neo. ChT, APR	1 year
Shimazaki [91]	1	68 M		Caecum	Adenocarcinoma	Met	Ileocecal resection	Met	2 years	Abdominal distention	Barium enema, colonoscopy, CT	Hartmann's procedure	Alive at 5 months
Ha [16]	1	N/S		Ascending colon	Poorly differentiated carcinoma	N/S							

APR = Abdominoperineal resection, ChT = Chemotherapy, HT = Hormonotherapy, RT = Radiotherapy, Neo. = Neoadjuvant, Adj. = Adjuvant, N/S = Not specified, N/A = Not applicable, Met = Metachronous, Syn = Synchronous, \* (from metastasis discovery).

disseminated diseases [64,68–70]. This was described in studies with outcomes calculated for any types of gastrointestinal metastases (small and large intestine, rectum and anus). Nonetheless, the most frequently observed metastasis site from melanoma in these studies was by far the small intestine (67-91%) [64,68]. Caution should be taken to apply such conclusions to RM from melanoma, as they only represented a small number of cases (2-4%). Moreover, taking into account advances and development in immunotherapy, this approach has to be considered as a potential treatment strategy for melanoma RM [101,102]. Regarding RM from lung cancer, Hu et al. reported similar results showing that absence of surgery appeared as a negative prognostic factor for survival outcome. [15] Again, RM represented a minor proportion (1.4%) in this study and outcomes were calculated by including all secondary cancer sites (duodenum, jejunum, ileum, appendix, caecum, colon, and rectum). Outcomes of metastases treated with small bowel resections, esophagectomies or abdominoperineal resections cannot be compared due to the differences of pathophysiology and surgery types.

Regarding immunohistochemical markers, it was observed that 85% (23/27) of RM from breast tumors were positive for the estrogen receptor (ER) while HER-2 was negative in 87% (13/15) of the cases. Recently, several articles demonstrated that ER-negative tumors had a higher proportion of visceral metastases, and that ER-positive tumors tended to first metastasize to bone [103–107]. The results of this review showed an opposite pattern regarding ER status, as a significant majority of the tumors were positive for this receptor and only 15% of the women (5/32) had bone metastases. It has also been suggested that ER-positive tumors tend to relapse later, whereas secondary events are more frequently observed in the first 5-7 years among ER-negative cancers [106,108]. In the present review, a median time of 6.5 years between primary and secondary cancer for the ER-positive tumors was found, which is shorter than usual time observed in the literature for this subgroup. Those findings may suggest the existence of a cluster group among ER-positive tumors which tends to metastasize sooner and more frequently to the rectum. These results should nevertheless be taken with caution because of the risk of publication bias.

Certain types of RM seem to have a better prognosis than others in terms of OS after occurrence of RM. In this review, among the articles where survival was mentioned, 2/4 patients with ovarian cancer RM survived >2 years and 14/27 patients with breast cancer RM survived >1 year after RM occurrence. On the contrary, only 2/10 patients with RM from gastric origin survived over a year. Taking aside the performed treatment, this suggests that RM from gastrointestinal origin might have a worse prognosis than RM from gynecological origin (Fig. 2).

Several limitations of the present review need to be mentioned. As articles on RM from different primary cancers (16 types) were collected, generalization for all RM is not possible. Another factor was the heterogeneity and variable quality of the selected articles. Some articles were fully complete in terms of patient follow-up, clinical and technical data, while others were missing some critical information. As all included articles were case reports or case series, quality assessment was not performed. Finally, heterogeneity of the data precluded any meta-analyses.

In conclusion, literature on RM remains scarce and is of poor quality. Surgical resection for RM appears to be indicated in selected patients and goes along with favorable outcomes. However, indication mainly depends on the underlying primary and global disease extent and requires careful evaluation by a multidisciplinary tumor board. RM from breast or ovarian origins might have a better OS than RM from gastrointestinal origins, regardless of undertaken treatments.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ejso.2021.10.004>.

## References

- [1] Wei S-C, Su W-C, Chang M-C, Chang Y-T, Wang C-Y, Wong J-M. Incidence, endoscopic morphology and distribution of metastatic lesions in the gastrointestinal tract. *J Gastroenterol Hepatol* 2007;22(6).
- [2] Abbas TO, Al-Naimi AR, Yakoob RA, Al-Bozom IA, Alobaidly AM. Prostate cancer metastases to the rectum: a case report. *World J Surg Oncol* 2011;9:56. <https://doi.org/10.1186/1477-7819-9-56>.
- [3] Culkun DJ, Demos TC, Wheeler JS, Castellini M, Canning JR. Separate annular strictures of the rectosigmoid colon secondary to unsuspected prostate cancer. *J Surg Oncol* 1990;43(3):189–92. <https://doi.org/10.1002/jso.2930430313>.
- [4] Liu Z-H, Li C, Kang L, Zhou Z-Y, Situ S, Wang J-P. Prostate cancer incorrectly diagnosed as a rectal tumor: a case report. *Oncol Lett* 2015;9(6):2647–50. <https://doi.org/10.3892/ol.2015.3100>.
- [5] Nwankwo N, Mirrakhimov AE, Zdunek T, Bucher N. Prostate adenocarcinoma with a rectal metastasis. *BMJ Case Rep* 2013;13. <https://doi.org/10.1136/bcr-2013-009503>.
- [6] Venara A, Thibaudeau E, Lebdaï S, Mucci S, Ridereau-Zins C, Azzouzi R, et al. Rectal metastasis of prostate cancer: about a case. *J Clin Med Res* 2010;2(3):137–9. <https://doi.org/10.4021/jocmr2010.05.309w>.
- [7] Winter CC. The problem of rectal involvement by prostatic cancer. *Surg Gynecol Obstet* 1957;105(2):136–40.
- [8] You JH, Song JS, Jang KY, Lee MR. Computed tomography and magnetic resonance imaging findings of metastatic rectal linitis plastica from prostate cancer: a case report and review of literature. *World J. Clin. Cases* 2018;6(12):554–8. <https://doi.org/10.12998/wjcc.v6.i12.554>.
- [9] Dumontier I, Roseau G, Palazzo L, Barbier J-P, Couturier D. Endoscopic ultrasonography in rectal linitis plastica. *Gastrointest Endosc* 1997;46(6):532–6. [https://doi.org/10.1016/S0016-5107\(97\)70009-9](https://doi.org/10.1016/S0016-5107(97)70009-9).
- [10] Vaghefi H, Magi-Galluzzi C, Klein EA. Local recurrence of prostate cancer in rectal submucosa after transrectal needle biopsy and radical prostatectomy. *Urology* 2005;66(4):881. <https://doi.org/10.1016/j.urology.2005.04.005>.
- [11] Hashash JG, Habib-Bein N, Khalid A, Francis FF. Recurrent bladder cancer presenting as rectal linitis plastica. *Endoscopy* 2015;47(S 1):E102-E103. <https://doi.org/10.1055/s-0034-1391300>.
- [12] Katsinelos P, Papaziogas B, Chatzimavroudis G, Katsinelos T, Dimou E, Atmatzidis S, et al. Secondary rectal linitis plastica as first manifestation of urinary bladder carcinoma. *Ann Gastroenterol* 2012;25(2):173–5.
- [13] Langenstroer P, Zacharias A, Almagro U, Dewire D. Annular constriction of the rectum secondary to transitional cell carcinoma of the bladder. *Urology* 1996;47(3):442–4. [https://doi.org/10.1016/S0090-4295\(99\)80471-3](https://doi.org/10.1016/S0090-4295(99)80471-3).
- [14] Yang M-H, Sun G-H, Yu D-S, Chang S-Y, Ma C-P, Cha T-L. CEA-producing urothelial cell carcinoma with metastasis presenting as a rectal adenocarcinoma. *Kaohsiung J Med Sci* 2012;28(11):624–7. <https://doi.org/10.1016/j.kjms.2012.04.030>.
- [15] Yusuf TE, Levy MJ, Wiersema MJ. EUS features of recurrent transitional cell bladder cancer metastatic to the GI tract. *Gastrointest Endosc* 2005;61(2):314–6. [https://doi.org/10.1016/S0016-5107\(04\)02578-7](https://doi.org/10.1016/S0016-5107(04)02578-7).
- [16] Ha HK, Jee KR, Yu E, Yu CS, Rha SE, Lee JJ, et al. CT features of metastatic linitis plastica to the rectum in patients with peritoneal carcinomatosis. *AJR Am J Roentgenol* 2000;174(2):463–6. <https://doi.org/10.2214/ajr.174.2.1740463>.
- [17] Gleeson FC, Clain JE, Rajan E, Topazian MD, Wang KK, Wiersema MJ, et al. Secondary linitis plastica of the rectum: EUS features and tissue diagnosis. *Gastrointest Endosc* 2008;68(3):591–6. <https://doi.org/10.1016/j.gie.2008.04.027>.
- [18] Wei S-C, Su W-C, Chang M-C, Chang Y-T, Wang C-Y, Wong J-M. Incidence, endoscopic morphology and distribution of metastatic lesions in the gastrointestinal tract. *J Gastroenterol Hepatol* 2007;22(6):827–31. <https://doi.org/10.1111/j.1440-1746.2006.04532.x>.
- [19] Wang J, Yue X, Zhao R, Cheng B, Wazir R, Wang K. Primary squamous cell carcinoma of seminal vesicle : an extremely rare case report with literature review. *Int Urol Nephrol* 2013;45(1):135–8. <https://doi.org/10.1007/s11255-012-0373-z>.
- [20] Dellon E-S, Gangarosa L-M. Hematochezia due to a renal cell carcinoma metastasis to the rectum: a case report and review of the literature. *Rev Gastroenterol México* 2006;71(3).
- [21] Ouellet S, Binette A, Nguyen A, Garde-Granger P, Sabbagh R. Metastatic renal cell carcinoma initially presenting with hematochezia and subsequently with vaginal bleeding: a case report. *BMC Urol* 2018;18(1):4. <https://doi.org/10.1186/s12894-018-0317-8>.
- [22] Rosito MA, Damin DC, Lazzaron AR, André C, Schwartzmann G. Metastatic renal cell carcinoma involving the rectum. *Int J Colorectal Dis* 2002;17(5):359–61. <https://doi.org/10.1007/s00384-002-0401-z>.
- [23] Zheng G, Li H, Li J, Zhang X, Zhang Y, Wu X. Metastatic renal clear cell carcinoma to the rectum, lungs, ilium, and lymph nodes : a case report. *Medicine* 2017;96(1):e5720. <https://doi.org/10.1097/MD.00000000000005720>.
- [24] Bailey CMH, Gilbert JM. Avoiding inappropriate surgery for secondary rectal cancer. *Eur J Surg Oncol: Eur J Surg Oncol and BASO* 2002;28(3):220–4. <https://doi.org/10.1053/ejso.2001.1240>.
- [25] Ambroggi M, Stroppa EM, Mordenti P, Biasini C, Zangrandi A, Michieletti E, et al. Metastatic breast cancer to the gastrointestinal Tract : report of five cases and review of the literature. *Int. J. Breast Cancer* 2012;12. <https://doi.org/10.1155/2012/439023>.
- [26] Amin AA, Reddy A, Jha M, Prasad K. Rectal metastasis from breast cancer: an interval of 17 years. *BMJ Case Rep* 2011;11. <https://doi.org/10.1136/bcr.01.2011.3683>.
- [27] Arrangoiz R, Papavasiliou P, Dushkin H, Farma JM. Case report and literature review: metastatic lobular carcinoma of the breast an unusual presentation. *Int. J. Surg. Case Rep.* 2011;2(8):301–5. <https://doi.org/10.1016/j.ijscr.2011.06.010>.
- [28] Asch MJ, Wiedel PD, Habib DV. Gastrointestinal metastases from carcinoma of the breast: autopsy study and 18 cases requiring operative intervention. *Arch Surg* 1968;96(5):840–3. <https://doi.org/10.1001/archsurg.1968.01330230148023>.
- [29] Balja MP, Vrdoljak DV, Stanec M, Sitić S, Supić DK, Knezević F. Rectal metastasis from lobular carcinoma of the breast: a case report. *Coll Antropol* 2010;34(2):719–21.
- [30] Balthazar E, Rosenberg H, Davidian M. Primary and metastatic scirrhous carcinoma of the rectum. *Am J Roentgenol* 1979;132(5):711–5. <https://doi.org/10.2214/ajr.132.5.711>.
- [31] Bamias A, Baltayiannis G, Kamina S, Fatouros M, Lymperopoulos E, Agnanti N, et al. Rectal metastases from lobular carcinoma of the breast: report of a case and literature review. *Ann Oncol* 2001;12(5):715–8. <https://doi.org/10.1023/a:1011192827710>.
- [32] Bar-Zohar D, Kluger Y, Michowitz M. Breast cancer metastasizing to the rectum. *Isr Med Assoc J* 2001;3(8):624–5.
- [33] Cervi G, Vettoretto N, Vinco A, Cervi E, Villanacci V, Grigolato P, et al. Rectal localization of metastatic lobular breast cancer: report of a case. *Dis Colon Rectum* 2001;44(3):453–5. <https://doi.org/10.1007/bf02234749>.
- [34] Cherian N, Qureshi NA, Cairncross C, Solkar M. Invasive lobular breast carcinoma metastasising to the rectum. *BMJ Case Rep.* 2017. <https://doi.org/10.1136/bcr-2016-215656>.
- [35] Clavien PA, Laffer U, Thorhost J, Harder F. Gastro-intestinal metastases as first clinical manifestation of the dissemination of a breast cancer. *Eur J Surg Oncol* 1990;16(2):121–6.
- [36] Efthimiadis C, Kosmidis C, Fotiadis P, Anthimidis G, Vasiliadou K, Mekras A, et al. Breast cancer metastatic to the rectum: a case report. *Tech Coloproctol* 2011;15(1):S91–3. <https://doi.org/10.1007/s10151-011-0740-2>.
- [37] Eljabu W, Finch G, Nottingham J, Vaingankar N. Metastatic deposits of breast lobular carcinoma to small bowel and rectum. *Int. J. Breast Cancer* 2011;12. <https://doi.org/10.4061/2011/413949>.
- [38] Elsaify W, Kanwar A, Nagarajan S. Lobular carcinoma of the breast: presentation, histopathological features and management of rectal metastasis. *Breast J* 2012;18(6):597–9. <https://doi.org/10.1111/tbj.12037>.
- [39] Franceschini G, Manno A, Mulè A, Verbo A, Verbo A, Rizzo G, Sermoneta D, et al. Gastro-intestinal symptoms as clinical manifestation of peritoneal and retroperitoneal spread of an invasive lobular breast cancer: report of a case and review of the literature. *BMC Cancer* 2006;6:193. <https://doi.org/10.1186/1471-2407-6-193>.
- [40] Gerova V, Tankova L, Mihova A, Drandarska I, Kadian H. Gastrointestinal metastases from breast cancer: report of two cases. *Hepato-Gastroenterology* 2012;59:178–81. <https://doi.org/10.5754/hge10681>.
- [41] Guzmán-Calderón E. Rectal metastases from breast cancer. A case report. *J Gastrointest Cancer* 2017;48(2):205–7. <https://doi.org/10.1007/s12029-016-9827-3>.
- [42] Ikeda Y, Morita N, Ikeda T. Metachronous rectal metastasis from invasive ductal carcinoma of the male breast. *Endoscopy* 2008;40(Suppl 2):E108–9. <https://doi.org/10.1055/s-2007-995392>.
- [43] Klein MS, Sherlock P. Gastric and colonic metastases from breast cancer. *Am J Dig Dis* 1972;17(10):881–6. <https://doi.org/10.1007/bf02239526>.
- [44] Laoutliv B, Harling H, Neergaard K, Simonsen L. Rectal metastasis from infiltrating lobular breast carcinoma: imaging with 18F-FDG PET. *Eur Radiol* 2005;15(1):186–8. <https://doi.org/10.1007/s00330-004-2394-1>.
- [45] Lau LC, Wee B, Wang S, Thian YL. Metastatic breast cancer to the rectum: a case report with emphasis on MRI features. *Medicine* 2017;96(17):e6739. <https://doi.org/10.1097/MD.0000000000006739>.
- [46] López Deogracias M, Flores Jaime L, Arias-Camión I, Zamacola I, Murillo Guibert J, Suescun García R, et al. Rectal metastasis from lobular breast carcinoma 15 years after primary diagnosis. *Clin Transl Oncol* 2010;12(2):150–3. <https://doi.org/10.1007/S12094-010-0481-0>.
- [47] Matsuda I, Matsubara N, Aoyama N, Hamanaka M, Yamagishi D, Kuno T, et al. Metastatic lobular carcinoma of the breast masquerading as a primary rectal cancer. *World J Surg Oncol* 2012;10:231. <https://doi.org/10.1186/1477-7819-10-231>.
- [48] Nair MS, Phillips BL, Navaratnam R, Fafemi O. Anorectal metastasis from breast carcinoma. *J Gastrointest Cancer* 2013;44(1):106–7. <https://doi.org/10.1007/s12029-012-9435-9>.
- [49] Ng C-E, Wright L, Pieri A, Belhasan A, Fasih T. Rectal metastasis from Breast cancer: a rare entity. *Int. J. Surg. Case Rep.* 2015;13:103–5. <https://doi.org/10.1016/j.ijscr.2015.06.023>.
- [50] Nieboer P, van der Graaf WTA, de Knecht RJ, van Dulleman HM. Rectal syndrome as first presentation of metastatic breast cancer. *Am J Gastroenterol*

- 2000;95(8):2138–9. <https://doi.org/10.1111/j.1572-0241.2000.02217.x>.
- [51] Osaku T, Ogata H, Magoshi S, Kubota Y, Saito F, Kanazawa S, et al. Metastatic nonpalpable invasive lobular breast carcinoma presenting as rectal stenosis: a case report. *J Med Case Rep* 2015;9:88. <https://doi.org/10.1186/s13256-015-0568-x>.
- [52] Carcoforo P, Raiji MT, Langan RC, Lanzara S, Portinari M, Maestroni U, et al. Infiltrating lobular carcinoma of the breast presenting as gastrointestinal obstruction: a mini review. *J Cancer* 2012;3:328–32. <https://doi.org/10.7150/jca.4735>.
- [53] Rajan SS, Saeed M, Mestrah M. Ductal carcinoma of the breast metastasizing to the rectum. *J Surg Case Rep* 2012;12(5). <https://doi.org/10.1093/jscr/2012.5.12>. 12–12.
- [54] Ruymbeke H, Harlet L, Stragier B, Steenkiste E, Ryckx M, Marolleau F. Anorectal metastasis from breast carcinoma: a case report and review of the literature. *BMC Res Notes* 2018;11(1):268. <https://doi.org/10.1186/s13104-018-3356-z>.
- [55] Saranovic D, Kovac JD, Knezevic S, Susnjar S, Stefanovic AD, Saranovic DS, et al. Invasive lobular breast cancer presenting an unusual metastatic pattern in the form of peritoneal and rectal metastases: a case report. *J Breast Cancer* 2011;14(3):247–50. <https://doi.org/10.4048/jbc.2011.14.3.247>.
- [56] Shimonov M, Rubin M. Metastatic breast tumors imitating primary colonic malignancies. *Isr Med Assoc J* 2000;2:863–4.
- [57] Venturini F, Gambi V, Di Lernia S, Vanzulli A, Bramerio MK, Amatu B, et al. Plastica of the rectum as a clinical presentation of metastatic lobular carcinoma of the breast. *J Clin Oncol* 2016;34(7):e54–6. <https://pubmed.ncbi.nlm.nih.gov/24982453/>.
- [58] Xue F, Liu Z-L, Zhang Q, Kong X-N, Liu W-Z. Mesorectum localization as a special kind of rectal metastasis from breast cancer. *World J Gastroenterol* 2015;21(14):4408–12. <https://doi.org/10.3748/wjg.v21.i14.4408>.
- [59] Amzerin M, Garcia C, Stanciu C, Veys I, Awada A, Errihani H, et al. Case Report: mammary and rectal metastases from an ovarian cancer: report of two cases and review of literature. *F1000Research* 2014;3:255. <https://doi.org/10.12688/f1000research.2644.1>.
- [60] Kalita D, Banno S, Talukdar A, Purkayastha J, Singh P, Yadav J, et al. Primary ovarian carcinoma with rectal metastasis—a rare presentation (a case report). *Indian J. Surg. Oncol.* 2019;10(3):520–2. <https://doi.org/10.1007/s13193-019-00946-1>.
- [61] Su H, Li B, Ren W, Bao M, Wang P, Liu Q, et al. Successful treatment of recurrent rectal implantation metastasis of ovarian cancer by natural orifice specimen extraction surgery: a case report. *OncoTargets Ther* 2018;11:5925–31. <https://doi.org/10.2147/OTT.S166535>.
- [62] Trastour C, Rahili A, Schumacker C, Effi AB, Bernard J-L. Hematogenous rectal metastasis 20 years after removal of epithelial ovarian cancer. *Gynecol Oncol* 2004;94(2):584–8. <https://doi.org/10.1016/j.ygyno.2004.05.022>.
- [63] Slimani KA, Debbagh A, Torreis M, Sbitti Y, Errihani H, Ichou M. An unusual case of rectal metastasis from ovarian cancer. *Austin J Clin Case Rep* 2016;3(4):1099.
- [64] Agrawal S, Yao T-J, Coit DG. Surgery for melanoma metastatic to the gastrointestinal tract. *Ann Surg Oncol* 1999;6(4):336–44. <https://doi.org/10.1007/s10434-999-0336-5>.
- [65] Blecker D, Abraham S, Furth E, Kochman ML. Melanoma in the gastrointestinal tract. *Am J Gastroenterol* 1999;94(12):3427–33. <https://doi.org/10.1111/j.1572-0241.1999.01604.x>.
- [66] Branum GD, Seigler HF. Role of surgical intervention in the management of intestinal metastases from malignant melanoma. *Am J Surg* 1991;162(5):428–31. [https://doi.org/10.1016/0002-9610\(91\)90254-B](https://doi.org/10.1016/0002-9610(91)90254-B).
- [67] Genova P, Sorce M, Cabibi D, Genova G, Gebbia V, Galanti D, et al. Gastric and rectal metastases from malignant melanoma presenting with hypochromic anemia and treated with immunotherapy. *Case Rep Oncol Med* 2017. <https://doi.org/10.1155/2017/2079068>.
- [68] Olila DW, Essner R, Wanek LA, Morton DL. Surgical resection for melanoma metastatic to the gastrointestinal tract. *Arch Surg* 1996;131(9):975–80. <https://doi.org/10.1001/archsurg.1996.01430210073013>.
- [69] Park J, Ng K-S, Saw RPM, Thompson JF, Young CJ. Metastatic melanoma to the colon, rectum, and Anus : a 50-year experience. *Ann Surg Oncol* 2018;25(8):2178–83. <https://doi.org/10.1245/s10434-018-6451-4>.
- [70] Sanki A, Scolyer RA, Thompson JF. Surgery for melanoma metastases of the gastrointestinal tract : indications and results. *Eur J Surg Oncol (EJSO)* 2009;35(3):313–9. <https://doi.org/10.1016/j.ejso.2008.04.011>.
- [71] Bandyopadhyay D, Kapadia CR, Da Costa PE. Pancreatic carcinoma : report of two cases presenting with unusual metastases. *Indian J Gastroenterol* 2005;24(2):75–6.
- [72] Carrara S, Leo MD, Spaggiari P, Bagnoli PF, Repici A. Rectal metastases from malignant mucinous cystic neoplasm of the pancreas mimicking a rectal carcinoma. *Gastrointest Endosc* 2018;87(1):312–3. <https://doi.org/10.1016/j.gie.2017.06.022>.
- [73] Fukatsu H, Nagahara Y, Ishiki K, Iwamura M, Hamada F. Pancreatic cancer metastasis to the rectum detected on colonoscopy. *Endoscopy* 2009;41(S 2):E167-E168. <https://doi.org/10.1055/s-0029-1214732>.
- [74] Ohara Y, Oda T, Enomoto T, Hisakura K, Akashi Y, Ogawa K, et al. Surgical resection of hepatic and rectal metastases of pancreatic acinar cell carcinoma (PACC) : a case report. *World J Surg Oncol* 2018;16(1):158. <https://doi.org/10.1186/s12957-018-1457-8>.
- [75] Liu K-W, Chen H-P, Yang C-H. Rectal metastasis following radiofrequency ablation for hepatocellular carcinoma. *Formos. J. Surg.* 2013;46(4):140–3. <https://doi.org/10.1016/j.fjs.2013.04.003>.
- [76] Derici ZS, Sokmen S. Gastric carcinoma presenting with severe rectal stenosis : 'Schnitzler's metastasis': case report and review of the literature. *Eur Surg* 2016;48:246–9. <https://doi.org/10.1007/s10353-016-0390-8>.
- [77] Doğan S, Demirbaş S, Samadov E, Öziş SE, Uslu HY. Rectal resection for Schnitzler's metastasis in a patient presenting with severe rectal stenosis : case report and review of the literature. *Eur J Sci Res* 2018;5(1):196–201. <https://doi.org/10.18621/eurj.378526>.
- [78] Epskamp C, van Eijck CHJ, Sinke RHJA, Hamberg P. « duodenal adenocarcinoma giving rise to rectal metastasis » a rare disease with an extremely rare metastatic pattern. *J Gastrointest Cancer* 2019;50(3):586–8. <https://doi.org/10.1007/s12029-018-0066-7>.
- [79] Eriksen CA. An unusual rectal carcinoma. A case report. *S. Afr. J. Surg.* 1992;30(4):151–2.
- [80] Hamada Y, Tanaka K, Katsurahara M, Baba Y. Solitary rectal metastasis from primary gastric cancer. *Intern Med* 2019;58(7):1037–8. <https://doi.org/10.2169/internalmedicine.1902-18>.
- [81] Lim SW, Huh JW, Kim YJ, Kim HR. Laparoscopic low anterior resection for hematogenous rectal metastasis from gastric adenocarcinoma: a case report. *World J Surg Oncol* 2011;9:148. <https://doi.org/10.1186/1477-7819-9-148>.
- [82] Makker J, Karki N, Sapkota B, Niaz M, Remy P. Rare presentation of gastroesophageal carcinoma with rectal metastasis: a case report. *Am. J. Med. Case Rep.* 2016;17:611–5. <https://doi.org/10.12659/ajcr.898534>.
- [83] Okugawa T, Oshima T, Ikeo K, Kondo T, Tomita T, Fukui H, et al. Successful self-expandable metallic stent placement for a case of distal rectal stenosis due to gastric cancer metastasis. *Case Rep. Gastroenterol* 2013;7(2):214–8. <https://doi.org/10.1159/000351818>.
- [84] Ponte A, Pinho R, Ribeiro I, Silva J, Rodrigues J, Carvalho J. Impacted foreign body causing acute malignant colonic obstruction. *GE Port. J. Gastroenterol.* 2016;23(1):42–5. <https://doi.org/10.1016/j.jpge.2015.07.002>.
- [85] Tariq T, Turk A, Reaume M, Muddasani A, Parmar M. Blocked by a ring: a case of gastric linitis plastica presenting as large bowel obstruction secondary to rectal stenosis. *ACG Case Rep. J.* 2019;6(2):e00007. <https://doi.org/10.14309/crj.0000000000000007>.
- [86] Tural D, Selçukbiricik F, Erçalışkan A, İnanç B, Günver F, Büyükkünal E. Metachronous rectum metastases from gastric adenocarcinoma: a case report. *J Med Case Rep* 2012. <https://doi.org/10.1155/2012/726841>.
- [87] Uemura N, Kurashige J, Kosumi K, Iwatsuki M, Yamashita K, Iwagami S, et al. Early gastric cancer metastasizing to the rectum, possibly via a hematogenous route: a case report and review of literature. *J Surg Case Rep* 2016;2(1):58. <https://doi.org/10.1186/s40792-016-0180-3>.
- [88] Kalaitzis J, Filippou G, Zizi-Sermpetzioglou A, Marinis A, Hadjimarcou A, Paschalidis N, et al. Case of a sigmoid colon cancer with metachronous metastases to the mesorectum and the abdominal wall. *World J Surg Oncol* 2010;8:17. <https://doi.org/10.1186/1477-7819-8-17>.
- [89] Kojima S, Sakamoto T, Nagai Y, Honda M, Ogawa F. Metachronous rectal metastasis from primary transverse colon cancer: a case report. *J Surg Case Rep* 2018;4(1):90. <https://doi.org/10.1186/s40792-018-0498-0>.
- [90] Lucke-Wold B, Bonasso PC, Cassim R. Primary colon adenocarcinoma with metastatic disease to the rectum followed by the left axilla. *Am. Med. Stud. Res. J.* 2017;4(1):57–61. <https://doi.org/10.15422/amrj.2017.03.009>.
- [91] Shimazaki J, Nakachi T, Tabuchi T, Ubukata H, Tabuchi T. Long-term survival of a patient with metachronous rectal metastasis from primary cecal cancer who underwent repetitive resection and chemotherapy: a case report. *World J Surg Oncol* 2014;12:107. <https://doi.org/10.1186/1477-7819-12-107>.
- [92] Cedrés S, Mulet-Margalef N, Montero MA, Martínez P, Martínez A, Felip E. Rectal metastases from squamous cell carcinoma: a case report and review of the literature. *J Med Case Rep* 2012;12:947524. <https://doi.org/10.1155/2012/947524>.
- [93] Han SH, Lee JW, Hyun CL, Yoo SY, Lee JH, Kwon JM, et al. Solitary rectal metastasis from primary small cell lung carcinoma. *Thorac. Cancer* 2012;3(3):284–6. <https://doi.org/10.1111/j.1759-7714.2011.00091.x>.
- [94] Johnson AOC, Allen MB. Rectal metastases from small cell lung cancer. *Respir Med* 1995;89(3):223–5. [https://doi.org/10.1016/0954-6111\(95\)90252-X](https://doi.org/10.1016/0954-6111(95)90252-X).
- [95] Martinez GE, Coursey CA, Dodd L, Martinez S. Simultaneous thigh muscle metastasis from lung cancer and Escherichia coli gas producing myonecrosis. *Skelet. Radiol.* 2008;37(8):763–6. <https://doi.org/10.1007/s00256-008-0489-5>.
- [96] Suzuki Y, Imasato M, Nakahara Y, Naito A, Mikamori M, Ohtsuka M, et al. Metachronous rectal metastasis from pulmonary adenocarcinoma after 11 years of chemo-, immuno-, and radiotherapy for recurrent lesions: a case report. *J Surg Case Rep* 2019;5(1):151. <https://doi.org/10.1186/s40792-019-0722-6>.
- [97] Hu Y, Feit N, Huang Y, Xu W, Zheng S, Li X. Gastrointestinal metastasis of primary lung cancer: an analysis of 366 cases. *Oncol. Lett.* 2018;15(6):9766–76. <https://doi.org/10.3892/ol.2018.8575>.
- [98] Hayasaka K, Nishashi T, Matsuura T, Yagi T, Nakashima K, Kawabata Y, et al. Metastasis of the gastrointestinal tract : FDG-PET imaging. *Ann Nucl Med* 2007;21(6):361–5. <https://doi.org/10.1007/s12149-007-0028-9>.
- [99] Suppiah A, Karanikas I, MacDonald A, Monson JRT, Hartley JE. Squamous cell carcinoma of the nasopharynx metastasising to rectum: first case report and literature review. *Anticancer Res* 2006;26(6C):4741–4.
- [100] Vogel M, Kourie HR, Piccart M, Lalami Y. Unusual presentation of nasopharyngeal carcinoma with rectal metastasis. *World J. Clin. Cases.* 2017;5(5):183–6. <https://doi.org/10.12998/wjcc.v5.i5.183>.

- [101] Dafni U, Michielin O, Lluesma SM, Tsourti Z, Polydoropoulou V, Karlis D, et al. Efficacy of adoptive therapy with tumor-infiltrating lymphocytes and recombinant interleukin-2 in advanced cutaneous melanoma: a systematic review and meta-analysis. *Ann Oncol.* 1 2019;30(12):1902–13.
- [102] Pasquali S, Hadjinicolaou AV, Chiarion Sileni V, Rossi CR, Mocellin S. Systemic treatments for metastatic cutaneous melanoma. *Cochrane Database Syst Rev* 2018;6(2):CD011123.
- [103] Dent R, Hanna WM, Trudeau M, Rawlinson E, Sun P, Narod S-A. Pattern of metastatic spread in triple-negative breast cancer. *Breast Cancer Res Treat* 2009;115(2):423–8. <https://doi.org/10.1007/s10549-008-0086-2>.
- [104] Campbell FC, Blamey RW, Elston CW, Nicholson RI, Griffiths K, Haybittle JL. Oestrogen-receptor status and sites of metastasis in breast cancer. *Br J Cancer* 1981;44(3):456–9. <https://doi.org/10.1038/bjc.1981.205>.
- [105] Hess KR, Puztai L, Buzdar AU, Hortobagyi GN. Estrogen receptors and distinct patterns of breast cancer relapse. *Breast Cancer Res Treat* 2003;78(1):105–18. <https://doi.org/10.1023/a:1022166517963>.
- [106] Savci-Heijink CD, Halfwerk H, Hooijer GK, Horlings HM, Wesseling J, van de Vijver MJ. Retrospective analysis of metastatic behaviour of breast cancer subtypes. *Breast Cancer Res Treat* 2015;150(3):547–57. <https://doi.org/10.1007/s10549-015-3352-0>.
- [107] Kast K, Link T, Friedrich K, Petzold A, Niedostatek A, Schoffer O, et al. Impact of breast cancer subtypes and patterns of metastasis on outcome. *Breast Cancer Res Treat* 2015;150(3):621–9. <https://doi.org/10.1007/s10549-015-3341-3>.
- [108] Olivia Pagani KN-G. Patterns of recurrence of early breast cancer according to estrogen receptor status: a therapeutic target for a quarter of a century. *Breast Cancer Res Treat* 2009;117(2):319–24.