Review article / *Pregledni članek*

Rectal carcinosarcoma in a patient with Crohn's disease – case report

Karcinosarkom rektuma pri bolniku s Crohnovo boleznijo – prikaz primera

Eva Supovec[1], Jurij Hanžel*[1,2]
[1]*Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia*
[2]*Department of Gastroenterology, University Medical Centre Ljubljana, Ljubljana, Slovenia*
Slovenian Journal of Gastroenterology / Gastroenterolog 2024; 3: 72–79

***Keywords**: carcinosarcoma, colorectal cancer, Crohn's disease*

***Ključne besede**: karcinosarkom, rak debelega črevesja in danke, Crohnova bolezen*

ABSTRACT

Background: Carcinosarcomas are rare, complex, poorly understood mixed malignancies, characterised by carcinomatous (epithelial) and sarcomatous (mesenchymal) differentiations. Although carcinosarcomas can occur in various organs, their occurrence in the colon and/or rectum is exceedingly rare, with only a limited number of cases reported in the literature, none occurring in the context of Crohn's disease. Herein, we describe (to our knowledge) the first reported case of carcinosarcoma of the rectum in a patient with Crohn's disease.

Case report: A 62-year-old man with Crohn's disease presented with abdominal cramps, weight loss and diarrhoea. Physical examination revealed tenderness of the stomach and hypotension, unresponsive to parenteral hydration. Abdominal ultrasound and computed tomography were performed and showed a large tumour at the rectosigmoid junction, multiple

IZVLEČEK

Ozadje: Karcinosarkomi so redki, kompleksni in slabo razumljeni mešani malignomi, za katere je značilna prisotnost karcinomatozne (epitelijske) in sarkomatozne (mezenhimske) diferenciacije. Čeprav se lahko pojavijo v različnih organih, izjemoma vzniknejo v debelem črevesu in/ali danki. V literaturi je navedeno le omejeno število primerov, pri čemer se nobeden ni pojavil v okviru Crohnove bolezni. V tem članku opisujemo (po našem vedenju) prvi opisani primer karcinosarkoma danke pri bolniku s Crohnovo boleznijo.

Opis primera: 62-letni moški s Crohnovo boleznijo je bil sprejet zaradi trebušnih krčev, hujšanja in driske. V kliničnem statusu je izstopal občutljiv in napet trebuh ter vztrajajoča hipotenzija, neodzivna na parenteralno hidracijo. Opravljena sta bila ultrazvok trebuha in računalniška tomografija, ki sta pokazala velik tumor na rektosigmoidnem prehodu, številne

*assist. prof. Jurij Hanžel, MD, PhD
Department of Gastroenterology, University Medical Centre Ljubljana, Japljeva ulica 2, 1000 Ljubljana, Slovenia
E-mail: jurij.hanzel@kclj.si

 Received: 12/2/2024; Review: 12/5/2024; Accepted for publication: 12/12/2024

abscesses and bowel obstruction. Emergency surgery with the resection of the rectosigmoid colon was performed. Histopathology revealed two cellular components, a high-grade adenocarcinoma and a rhabdomyosarcoma, leading to the diagnosis of rectal carcinosarcoma. The patient received adjuvant chemotherapy. The progression of the disease was rapid and unfavourable, with local recurrence in the pelvis and multiple metastases in the liver, leading to death 4 months after the initial surgery.

Conclusion: Rectal carcinosarcomas are very aggressive tumours with unclear histogenesis and poor prognosis. The optimal treatment strategies are still a subject of debate.

abscese in obstruktivni ileus. Opravljena je bila nujna operacija z resekcijo rektuma in sigme.

Histopatološki izvid je pokazal mešan tumor, sestavljen iz dveh komponent - adenokarcinoma visoke stopnje in rabdomiosarkoma. Postavljena je bila diagnoza karcinosarkoma danke. Bolnik je prejel adjuvantno kemoterapijo. Bolezen je hitro napredovala, z lokalno ponovitvijo tumorja v medenici in številnimi metastazami v jetrih. Bolnik je 4 mesece po operaciji umrl.

Zaključek: Karcinosarkomi danke so zelo agresivni tumorji z nejasno histogenezo in slabo prognozo. Smernic zdravljenja zaenkrat še ni.

INTRODUCTION

Patients with Crohn's disease are known to have an increased risk of small intestine and colorectal (CRC) adenocarcinoma, as well as other intestinal neoplasms such as lymphoma and carcinoid tumours. (1–3) Carcinosarcomas in the context of Crohn's disease remain an exceedingly rare phenomenon, with only a handful of cases reported. Most studies of CRC in inflammatory bowel disease only briefly mention the sporadic occurrences of carcinosarcomas. (4) Only one case of carcinosarcoma in a patient with Crohn's disease has been thoroughly documented, and it occurred in the small bowel (5). Therefore, no patients of colorectal carcinosarcoma in the context of Crohn's disease have been reported in the literature as far we are aware.

Carcinosarcomas are rare biphasic tumours, characterised by the existence of both epithelial and mesenchymal malignant differentiation. They have been described in various organs, most frequently occurring in the female urogenital tract (6–8), the respiratory tract (9–11) and in the head and neck (12, 13). Carcinosarcomas of the gastrointestinal tract are extremely sparse and arise predominantly in the oesophagus (14–17), the gallbladder (18), the stomach (19–22) and rarely in the large intestine. Till present, only twenty-six cases of large intestine and rectal carcinosarcomas have been reported in the English literature (23–47). Herein we present a 62-year-old patient with Crohn's disease, who developed a rectal carcinosarcoma and review the relevant literature on this rare malignancy.

CASE REPORT

A 62-year-old male was transferred to our tertiary centre because of a suspected sigmoid tumour. He was previously treated at a secondary hospital due to septic shock. The patient had been experiencing malaise, abdominal cramps and diarrhoea without traces of blood or mucus. Additionally, he had unintentionally lost 10 kg in the last three months. Previous medical history revealed Crohn's disease of the large intestine, diagnosed 25 years ago, which had been treated with biologicals (adalimumab) for the past three months and mesalazine beforehand. The last colonoscopy was performed 11 months ago and showed active disease with ulcerations in the left colon. Their family history was negative for colorectal cancer. The patient was hypotensive and did not respond to parenteral hydration. Subsequently, vasoactive support with noradrenaline was needed. An abdominal CT with contrast showed a formation in the pelvis, dubious of an abscess. The patient was

transferred to our tertiary centre, where another abdominal ultrasound and CT were performed, showing a lobulated, heterogeneous tumour at the rectosigmoid junction, measuring 13 x 6.8 x 8 cm. In addition, multiple abscesses and an obstructive ileus were also seen. The patient underwent emergency surgery. Resection of the rectosigmoid colon by Hartmann's procedure was performed.

Histopathology revealed a carcinosarcoma of the rectum, stage pT4a N1a (1/16) M0, with heterologous rhabdomyosarcomatous differentiation and a high-grade (III) adenocarcinoma component, which comprised only about 5% of the tumour. The tumour was overgrowing the muscularis propria, invading the perirectal fat and extending to the free serosal surface of the bowel. Adjuvant chemotherapy with capecitabine was started. In the 3rd postoperative month, the patient was hospitalised twice due to general weakness, vomiting, obstipation and anuria. He was cachectic and immobile, with a distended abdomen and peripheral oedema. Follow-up abdominal CT revealed local recurrence of the tumour, which was filling the pelvis, impinging on both ureters and causing bilateral hydronephrosis. In addition, multiple hepatic metastatic foci were found. Anuria was resolved with bilateral nephrostomy insertion. The patient received palliative care and succumbed to his disease at the 4th postoperative month.

ANALYSIS OF CASE REPORTS

We reviewed clinical and pathohistological features of all 26 reported cases (23–47) including ours (Table 1). The average age of occurrence was 68 years with extremes of age between 13 and 83 years. Both sexes were equally affected (13 males vs 14 females). The most common location of the primary tumour was the left colon (17 patients) including rectum, sigmoid colon, and descending colon, respectively. Only one case occurred in the transverse colon. All patients, except for one, underwent primary tumour resection with curative or palliative intent, while the remaining patients received only palliative chemotherapy due to advanced disease. Twelve patients received preoperative or postoperative adjuvant chemotherapy and three patients received radiotherapy. Local recurrence in the pelvic cavity was common (30%) (24, 26, 28, 30, 32, 38, 40), and carcinosarcoma showed a tendency of distant metastasis, with 13 cases reported. The most common metastatic sites were the liver (8 cases), (24, 28, 29, 31, 32, 39, 42) lungs (6 cases), (24, 32, 33, 41, 42, 45) and the peritoneum or omentum (6 cases) (24, 32, 38, 41, 44, 45). Ten patients also had metastases in regional lymph nodes (24, 28, 29, 33, 40–42, 45, 48). Overall, the prognosis was poor, with most patients dying within 1 to 49 months (mean survival: 8.8 months). Twelve patients were lost to follow-up with the longest recorded survival reaching 24 months (mean survival: 9 months). Patients who received adjuvant therapy (chemotherapy or radiotherapy) had a mean survival of 12.0 months. It was almost twice as long as the 6.8 months observed in patients who did not receive adjuvant therapy. This comparison suggests that adjuvant therapy may have a considerable impact on survival, potentially improving outcomes for those who undergo additional treatment before or after surgery.

DISCUSSION

Carcinosarcomas of the colon have previously been referred to by various names (sarcomatoid carcinomas, spindle-cell carcinoma, pseudosarcomatous carcinoma, pleomorphic anaplastic carcinoma, small-cell carcinoma, etc.), leading to uncertainty regarding their classification (37, 38, 40, 42, 49), Carcinosarcomas are rare malignancies, first described in the colon by Weider and Zekan et al in 1986 (28). Since then, 26 (23–47) additional cases including ours have been reported and are summarised in Table 1.

Histologically, carcinosarcomas consist of an epithelial component, typically a mid- to high-grade adenocarcinoma, and a sarcomatous component of mesenchymal origin, which can be differentiated or undifferentiated (44). Differentiated sarcomatous components are classified as homologous if they contain elements typically found in the colon (e.g., fibrosarcoma, leiomyosarcoma) or heterologous if they contain elements

Table 1. Summary of the reported cases of colonic carcinosarcoma

No.	Author	Age/ Sex	Location	Differentiation of sarcoma	Local recurrence; distant or LN metastasis	Adjuvant treatment	Survival post-surgery
1	Weidner and Zekan (1986)	73/M	Sigmoid colon	Osteosarcoma, chondrosarcoma, undifferentiated spindle cell sarcoma	Pelvis; Liver, LN	Postoperative CTX	49 months (DOD)
2	Chetty (1993)	72/F	Cecum	Rhabdomyosarcoma	Liver, LN	None	Alive at 3-month follow-up
3	Roncaroli (1995)	71/F	Rectum	Rhabdomyosarcoma	Pelvis	Preoperative RT	6 months (DOD)
4	Bertram (1996)	79/F	Cecum, ascending colon	Unknown	Liver	Postoperative CTX	5 months (DOD)
5	Isimbaldi (1996)	86/F	Ascending colon	Undifferentiated	None	None	Alive at 24-month follow-up
6	Serio (1997)	69/F	Descending colon	Leiomyosarcoma or malignant fibrous histiocytoma	None	None	Alive at 6-month follow-up
7	Shoji (1998)	78/M	Descending colon	Undifferentiated sarcoma	None	Postoperative CTX	Alive at 16-month follow-up
8	Nakao (1998)	60/F	Transverse colon	Neurofibrosarcoma, rhabdomyosarcoma	None	Postoperative CTX	Alive at 14-month follow-up
9	Takeyoshi (2000)	82/M	Rectum	Spindle cells sarcoma	Skin	None	6 months (DOD)
10	Shah (2001)	57/F	Sigmoid colon, rectum	Chondrosarcoma	Pelvis; Liver, peritoneum, spleen, lungs	None	5 months (DOD)
11	Kim (2001)	41/F	Sigmoid colon	Undifferentiated sarcoma	LN, liver, lungs, brain	Postoperative CTX	4 months (DOD)
12	Ishida (2003)	80/F	Sigmoid colon, rectum	Leiomyosarcoma and rhabdomyosarcoma	Pelvis	None	6 months (DOD)
13	Aramendi (2003)	84/M	Descending colon (splenic flexure)	Osteo- and chondrosarcoma	None	None	Died 4 days post. surgery
14	Kim (2005)	71/M	Ascending colon, duodenum, gallbladder (unknown site of origin)	Fibrosarcoma, osteosarcoma, histiocytoma	Abdominal wall, extensive carcinomatosis	None	Lost to follow-up, probably DOD

Table 1. Continued

No.	Author	Age/ Sex	Location	Differentiation of sarcoma	Local recurrence; distant or LN metastasis	Adjuvant treatment	Survival post-surgery
15	Ambrosini -Spaltro (2006)	81/M	Ascending colon	Leiomyosarcoma, osteosarcoma	Liver	Postoperative CTX	Alive at 24-month at follow-up with liver metastases
16	Tsekouras (2006)	60/M	Rectum	Undifferentiated sarcoma	Pelvis; Liver, lungs, peritoneum, LN	Postoperative CTX and RT	6 months (DOD)
17	Lee (2008)	52/F	Rectum	Undifferentiated sarcoma	None	None	Alive at 8-month follow-up
18	Jeong (2008)	13/F	Sigmoid colon, rectum	Undifferentiated sarcoma	Pelvis, LN	Postoperative CTX	Alive at 2-month follow-up
19	Shim (2010)	65/M	Ascending colon	Rhabdomyosarcoma	Peritoneal carcinomatosis, lungs, LN	None	1 month (DOD)
20	Mori (2010)	65/M	Sigmoid colon	Undifferentiated sarcoma	None	Postoperative CTX	10 months (DOD)
21	Ryu (2012)	72/F	Cecum	Undifferentiated sarcoma	None	None	Alive at 20-month follow-up
22	Kolodziejc zak (2013)	83/M	Rectum	Leiomyosarcoma	None	None	5 weeks (DOD)
23	Sudlow (2015)	80/F	Rectum	Leiomyosarcoma	Lungs, LN	Preoperative RT	25 months (DOD)
24	Osholowu (2017)	68/M	Rectum	Undifferentiated sarcoma	Omentum, lungs, LN	Only palliative CTX, no surgery	Unknown
25	Kyriakos Saad (2020)	67/M	Cecum	Chondrosarcoma and leiomyosarcoma	LN	None	Alive at 1-month follow-up
26	Maskrout (2022)	58/F	Cecum	Undifferentiated sarcoma	Aortic arch, both adrenal glands, peritoneum, bones	Postoperative CTX	4 months (DOD)
27	Present case (2024)	62/M	Rectum	Rhabdomyosarcoma	Liver, LN	Postoperative CTX	4 months (DOD)
Abbreviations: LN, lymph nodes; CTX, chemotherapy; RT, radiotherapy; DOD, died of disease							

not typically found in the colon (e.g., chondrosarcoma, osteosarcoma, rhabdomyosarcoma, etc.). The sarcomatous component is heterogeneous as multiple elements in one tumour have been reported (23, 25, 26, 28, 36, 38, 39, 48). Characterisation of carcinosarcomas has been accomplished through immunohistochemistry, which confirms the presence of both distinct components. The adenocarcinomatous component typically shows reactivity to epithelial markers such as cytokeratin 20 (CK20) and carcinoembryonic antigen (CEA). (34, 40) The sarcomatous cells stain positively for vimentin, desmin, and smooth muscle actin (SMA). (28, 34, 37, 42, 44, 47) In our patient, immunohistochemical stains demonstrated spindle cell rhabdomyosarcoma with neural differentiation.

The histogenesis of carcinosarcomas also remains a subject of debate. Some researchers (50, 51) argue that the carcinomatous and sarcomatous components arise from separate and distinct malignant cell clones (multiclonal hypothesis), pointing out that carcinosarcomas display clearly defined biphasic epithelial and mesenchymal components, with no malignant cells showing transitional or shared characteristics. On the other hand, other researchers (8, 39, 42, 52, 53) support the hypothesis of a common cell precursor (monoclonal hypothesis), as they have identified common features (e. g. mutation R282W in exon 8 of the p53 gene, the loss of 18q21, etc.) and transitional cells between the two components. The monoclonal hypothesis has been explained either by conversion theory (i. e. metaplastic transformation of one neoplastic cell (e.g. carcinoma) into the other (e.g. sarcoma) as reported by Delahunt (53)) or by the combination theory (i. e. a stem cell origin for both cell components) (40). Given the controversy, the diagnostic term carcinosarcoma was chosen as it does not imply that the tumour originates from either a carcinomatous or sarcomatous source, nor does it imply that the tumour arises from one or two distinct malignant cell clones (28).

Carcinosarcomas of the lower gastrointestinal tract are typically aggressive tumours with a poor prognosis (38). They are characterised by quick growth, extensive local invasion and frequent local or hematogenous recurrence.(44) In addition, their symptoms (rectal bleeding, weight loss, abdominal pain and signs of obstruction) usually emerge at the advanced local stage of the disease or after distant metastases have developed, resulting in a late diagnosis and a poorer prognosis (41, 44). They most frequently metastasise to the liver, lungs, peritoneum or omentum. Metastases in regional lymph nodes are also common. Similarly, the tumour was highly invasive and demonstrated widespread dissemination to the lymph nodes and liver. However, short survival and poor prognosis are not typical for all gastrointestinal carcinosarcomas. Tumours of the oesophagus or stomach tend to have a better prognosis because their intraluminal growth often results in early obstructive symptoms. This leads to quicker diagnosis and the possibility of curative treatment before deep invasion occurs (5, 41).

The aggressive behaviour of carcinosarcomas mirrors that of adenocarcinomas. Namely, the carcinomatous components usually are more liable to metastasize to lymph nodes and distant sites than the sarcomatous components of carcinosarcomas (5, 29, 30, 33, 40). The lymph node metastasis in our patient likely originated from the adenocarcinomatous component, despite the carcinoma making up only about 5% of the tumour. However, further pathohistological examination would be required for confirmation.

Because colorectal carcinosarcoma is extremely infrequent, the factors affecting the prognosis are still not fully understood (40). Suggested prognostic indicators include tumour size, stage, lymphatic or vascular invasion, and histology of the carcinomatous component.

The analysis of carcinosarcomas can be difficult, particularly when dealing with small biopsy fragments or undifferentiated spindle cell tumours without clear glandular differentiation. Immunohistochemistry and electron microscopy can aid light microscopy in confirming the diagnosis (42). Surgical treatment remains the standard of care and comprises surgical resection of the primary tumour (colectomy) and its regional

draining lymph nodes (23–30,33). The optimal adjuvant chemotherapy or radiotherapy regimen has yet to be determined as no specific treatment guidelines for carcinosarcomas exist. Chemotherapy regimens involving 5-fluorouracil, leucovorin, doxorubicin, and cisplatin have been explored and show some potential, though their true effectiveness has not been established. While our review suggests that chemotherapy may improve survival, most studies report no convincing benefit, as the 5-year survival rate remains dismal (5, 48).

CONCLUSION

In summary, this report highlights the first case of colonic carcinosarcoma in a Crohn's disease patient. Colorectal carcinosarcomas are rare tumours with only twenty-six examples reported in the English literature. While their pathogenesis remains poorly understood, they typically follow a highly aggressive, rapid course, marked by fast growth, extensive local invasion and a high tendency to metastasise, leading to a dismal prognosis. While no specific treatment guidelines have been established for these tumours, surgery, close monitoring and possibly even adjuvant chemotherapy are essential. However, most patients succumb to the disease within months despite appropriate treatment.

References

1. Freeman HJ. Colorectal cancer risk in Crohn's disease. World J Gastroenterol WJG. 2008;14:1810–1. doi: 10.3748/wjg.14.1810.
2. Freeman HJ. Appendiceal carcinoids in Crohn's disease. Can J Gastroenterol J Can Gastroenterol. 2003; 17: 43–6. doi: 10.1155/2003/625368.
3. Freeman HJ. Tabulation of myeloid, lymphoid and intestinal malignancies in Crohn's disease. Can J Gastroenterol J Can Gastroenterol. 2002; 16: 779-84. doi: 10.1155/2002/193285.
4. Kuwahara R, Ikeuchi H, Kusunoki K, et al. Clinical features and surgical selection in colitis-associated colorectal cancer with ulcerative colitis. BMC Surg. 2023; 23: 256. doi: 10.1186/s12893-023-02160-x.
5. Radi MF, Gray GF, Scott HW. Carcinosarcoma of ileum in regional enteritis. Hum Pathol. 1984; 15: 385-7. doi: 10.1016/s0046-8177(84)80038-6.
6. Baiocchi G, Kavanagh JJ, Wharton JT. Endometrioid stromal sarcomas arising from ovarian and extraovarian endometriosis: report of two cases and review of the literature. Gynecol Oncol. 1990; 36: 147-51. doi: 10.1016/0090-8258(90)90126-6.
7. Norris HJ, Taylor HB. Mesenchymal tumours of the uterus. 3. A clinical and pathologic study of 31 carcinosarcomas. Cancer. 1966; 19: 1459-65. doi: 10.1002/1097-0142(196610)19:10<1459::aid-cncr2820191019>3.0.co;2-a.
8. Steeper TA, Piscioli F, Rosai J. Squamous cell carcinoma with sarcoma-like stroma of the female genital tract. Clinicopathologic study of four cases. Cancer. 1983; 52: 890-8. doi: 10.1002/1097-0142(19830901)52:5<890 ::aid-cncr2820520525>3.0.co;2-t.
9. Takeda S, Nanjo S, Nakamoto K, et al. Carcinosarcoma of the Lung: Report of a Case and Review of the Literature. Respiration. 2009; 61: 113-6. doi: 10.1159/000196319.
10. Zarbo RJ, Crissman JD, Venkat H, et al. Spindle-cell carcinoma of the upper aerodigestive tract mucosa. An immunohistologic and ultrastructural study of 18 biphasic tumours and comparison with seven monophasic spindle-cell tumours. Am J Surg Pathol. 1986; 10: 741-53. doi: 10.1097/00000478-198611000-00001.
11. Humphrey PA, Scroggs MW, Roggli VL, et al. Pulmonary carcinomas with a sarcomatoid element: an immunocytochemical and ultrastructural analysis. Hum Pathol. 1988; 19: 15-65. doi: 10.1016/ s0046-8177(88)80343-5.
12. Berthelet E, Shenouda G, Black MJ, et al. Sarcomatoid carcinoma of the head and neck. Am J Surg. 1994; 168: 455-8. doi: 10.1016/s0002-9610(05)80098-4.
13. Leventon GS, Evans HL. Sarcomatoid squamous cell carcinoma of the mucous membranes of the head and neck: a clinicopathologic study of 20 cases. Cancer. 1981; 48: 994-1003. doi: 10.1002/1097-0142(19810815)48:4<994::aid-cncr2820480424>3.0.co;2-m.
14. Madan AK, Long AE, Weldon CB, et al. Esophageal carcinosarcoma. J Gastrointest Surg Off J Soc Surg Aliment Tract. 2001; 5: 414-7. doi: 10.1016/s1091-255x (01)80071-8.
15. Kuhajda FP, Sun TT, Mendelsohn G. Polypoid squamous carcinoma of the oesophagus. A case report with immunostaining for keratin. Am J Surg Pathol. 1983; 7: 495-9. doi: 10.1097/00000478-198307000-00013.
16. Ikura Y, Hosotani R, Aoyama H, et al. Carcinosarcoma of the oesophagus: A report of two cases. Surg Today. 1993; 23: 562-7. doi: 10.1007/BF00730636.
17. Gal AA, Martin SE, Kernen JA, et al. Esophageal carcinoma with prominent spindle cells. Cancer. 1987; 60: 2244-50. doi: 10.1002/1097-0142(19871101)60:9<2244::aid-cncr2820600924>3.0.co;2-o
18. Gao S, Huang L, Dai S, et al. Carcinosarcoma of the gallbladder: a case report and review of the literature. Int J Clin Exp Pathol. 2015; 8: 7464-9.
19. Tsuneyama K, Sasaki M, Sabit A, et al. A case report of gastric carcinosarcoma with rhabdomyosarcomatous and neuroendocrinal differentiation. Pathol Res Pract. 1999; 195: 93-7; discussion 98. doi: 10.1016/S0344-0338(99)80077-6.

20. Bansal M, Kaneko M, Gordon RE. Carcinosarcoma and separate carcinoid tumours of the stomach. A case report with light and electron microscopic studies. Cancer. 1982; 50: 1876-81. doi: 10.1002/1097-0142(19821101)50:9<1876::aid-cncr2820500937>3.0.co;2-7.
21. Robey-Cafferty SS, Grignon DJ, Ro JY, et al. Sarcomatoid carcinoma of the stomach. A report of three cases with immunohistochemical and ultrastructural observations. Cancer. 1990; 65: 1601-6. doi: 10.1002/1097-0142(19900401)65:7<1601::AID-CNCR2820650725>3.0.CO;2-N.
22. Hanada M, Nakano K, Ii Y, et al. Carcinosarcoma of the stomach. A case report with light microscopic, immunohistochemical, and electron microscopic study. Acta Pathol Jpn. 1985; 35: 951-9.
23. Nakao A, Sakagami K, Uda M, et al. Carcinosarcoma of the colon: report of a case and review of the literature. J Gastroenterol. 1998; 33: 276-9. doi: 10.1007/s005350050083.
24. Tsekouras DK, Katsaragakis S, Theodorou D, et al. Rectal carcinosarcoma: A case report and review of the literature. World J Gastroenterol WJG. 2006; 12: 1481. doi: 10.3748/wjg.v12.i9.1481.
25. Aramendi T, Fernández-Aceñero MJ, Villanueva MC. Carcinosarcoma of the Colon: Report of a Rare Tumor. Pathol - Res Pract. 2003; 199: 345-8. doi: 10.1078/0344-0338-0428.
26. Ishida H, Ohsawa T, Nakada H, et al. Carcinosarcoma of the rectosigmoid colon: report of a case. Surg Today. 2003; 33: 545-9. doi: 10.1007/s10595-002-2526-8.
27. Takeyoshi I, Yoshida M, Ohwada S, et al. Skin metastasis from the spindle cell component in rectal carcinosarcoma. Hepatogastroenterology. 2000; 47: 1611-4.
28. Weidner N, Zekan P. Carcinosarcoma of the colon. Report of a unique case with light and immunohistochemical studies. Cancer. 1986; 58: 1126-30. doi: 10.1002/1097-0142(19860901)58:5<1126::aid-cncr2820580525>3.0.co;2-q.
29. Chetty R, Bhathal PS. Caecal adenocarcinoma with rhabdoid phenotype: an immunohistochemical and ultrastructural analysis. Virchows Arch A Pathol Anat Histopathol. 1993; 422: 179-82. doi: 10.1007/BF01607171.
30. Roncaroli F, Montironi R, Feliciotti F, et al. Sarcomatoid carcinoma of the anorectal junction with neuroendocrine and rhabdomyoblastic features. Am J Surg Pathol. 1995; 19: 217–23. doi: 10.1097/00000478-199502000-00010.
31. Bertram P, Treutner KH, Tietze L, et al. True carcinosarcoma of the colon. Case report. Langenbecks Arch Chir. 1997; 382: 173-4. doi: 10.1007/BF02498672.
32. Shah S, Kim DH, Harster G, et al. Carcinosarcoma of the colon and spleen: a fleshy purple mass on colonoscopy. Dig Dis Sci. 2001; 46: 106-8. doi: 10.1023/a:1005682413793.
33. Sudlow A, Liu MH, Waters G, et al. Carcinosarcoma of the Rectum: Report of a Rare Colorectal Malignancy and Review of the Literature. Case Rep Surg. 2015; 2015: 412918. doi: 10.1155/2015/412918.
34. Ryu Y, Kim A, Kim H, et al. Carcinosarcoma in the cecum. Gut Liver. 2012; 6: 395-8. doi: 10.5009/gnl.2012.6.3.395.
35. Isimbaldi G, Sironi M, Assi A. Sarcomatoid Carcinoma of the Colon: Report of the Second Case with Immunohistochemical Study. Pathol - Res Pract. 1996; 192: 483-7. doi: 10.1016/S0344-0338(96)80015-X.
36. Serio G, Aguzzi A. Spindle and giant cell carcinoma of the colon. Histopathology. 1997; 30: 383-5. doi: 10.1046/j.1365-2559.1997.d01-610. x.
37. Shoji M, Dobashi Y, Iwabuchi K, et al. Sarcomatoid carcinoma of the descending colon--a histological, immunohistochemical and ultrastructural analysis. Acta Oncol Stockh Swed. 1998;37:765–8. doi: 10.1080/028418698430179.
38. Kim N, Luchs JS, Halpern D, et al. Radiology-Pathology Conference: carcinosarcoma of the colon. Clin Imaging. 2005; 29: 259-62. doi: 10.1016/j.clinimag.2004.09.002.
39. Ambrosini-Spaltro A, Vaira V, Braidotti P, et al. Carcinosarcoma of the colon: report of a case with morphological, ultrastructural and molecular analysis. BMC Cancer. 2006; 6: 185. doi: 10.1186/1471-2407-6-185.
40. Jeong YJ, Lee MR, Kim JC, et al. Carcinosarcoma of the rectosigmoid colon in a 13-year-old girl. Pathol Int. 2008; 58: 445-50. doi: 10.1111/j.1440-1827.2008. 02252.x.
41. Shim HJ, Hong YK, Kim S-J, et al. Carcinosarcoma on Ascending Colon Found by Bowel Perforation: A Case Report. J Korean Soc Coloproctology. 2010; 26: 368-72. doi: 10.3393/ jksc.2010.26.5.368.
42. Kim JH, Moon WS, Kang MJ, et al. Sarcomatoid carcinoma of the colon: a case report. J Korean Med Sci. 2001; 16: 657-60. doi: 10.3346/jkms.2001.16.5.657.
43. Kołodziejczak M, Bielecki K, Sudoł-Szopińska I, et al. Very rare case of rectal carcinosarcoma. Tech Coloproctology. 2013; 17: 615-7. doi: 10.1007/s10151-012-0947-x.
44. Maskrout M, Boutaggount F, Mokfi R, et al. Carcinosarcoma of the colon with extensive and extraordinary metastases detected on F-FDG18PET/CT: A case report. Ann Med Surg. 2022; 81: 104450. doi: 10.1016/j.amsu.2022.104450.
45. Osholowu O, Reisdorf C, Hall D, et al. A Rare Case of Sarcomatoid Tumor of the Colon: 1409. Off J Am Coll Gastroenterol ACG. 2017; 112: S763.
46. Mori Y, Katsumata K, Suzuki S, et al. Carcinosarcoma of the Sigmoid Colon: Report of a Case. Case Rep Gastroenterol. 2010; 4: 484-91. doi: 10.1159/000318739.
47. Lee JK, Ghosh P, McWhorter V, et al. Evidence for colorectal sarcomatoid carcinoma arising from tubulovillous adenoma. World J Gastroenterol. 2008; 14: 4389-94. doi: 10.3748/wjg.14.4389.
48. Kyriakos Saad M, Ghandour F, Ghandour El Hajj F, et al. Colonic Carcinosarcoma: Report of a Rare Colorectal Malignancy and Review of Literature. Gastrointest Tumors. 2021; 8: 8-15. doi: 10.1159/000510628.
49. Clery AP, Dockerty MB, Waugh JM. Small-cell carcinoma of the colon and rectum. A clinicopathologic study. Arch Surg Chic Ill 1960. 1961; 83: 164-72. doi: 10.1001/archsurg.1961.01300140006002.
50. Minckler DS, Meligro CH, Norris HT. Carcinosarcoma of the larynx. Case report with metastases of epidermoid and sarcomatous elements. Cancer. 1970; 26: 195-200. doi: 10.1002/1097-0142(197007)26:1<195::aid-cncr2820260125>3.0.co;2-d.
51. Huszar M, Herczeg E, Lieberman Y, et al. Distinctive immunofluorescent labelling of epithelial and mesenchymal elements of carcinosarcoma with antibodies specific for different intermediate filaments. Hum Pathol. 1984; 15: 532-8. doi: 10.1016/s0046-8177(84)80006-4.
52. Wick MR, Perrone TL, Burke BA. Sarcomatoid transitional cell carcinomas of the renal pelvis. An ultrastructural and immunohistochemical study. Arch Pathol Lab Med. 1985; 109: 55-8.
53. Delahunt B, Eble JN, Nacey JN, et al. Sarcomatoid carcinoma of the prostate: progression from adenocarcinoma is associated with p53 over-expression. Anticancer Res. 1999; 19: 4279-83.