The role of stereotactic radiotherapy in the treatment of the local recurrence of colorectal cancer - a case report

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SUMARY

Colorectal cancer is one of the most common malignant diseases worldwide. A multidisciplinary approach to treatment involves surgery and chemotherapy, while radiotherapy is used in the treatment of tumors localized in the pelvis. Stereotactic radiotherapy allows the delivery of high, ablative radical radiotherapy doses to target volumes, with a reduced risk to the surrounding organs, making it suitable for irradiating localized disease. A 59-year-old female S.M. presented to the doctor due to the appearance of a perianal fistula. Colonoscopy was performed, revealing a moderately differentiated adenocarcinoma. Magnetic resonance imaging (MRI) examination diagnosed a tumor lesion of the rectosigmoid junction with a perilesional abscess collection and several fistulous channels communicating with the perianal skin. The patient underwent surgery with adjuvant chemotherapy. A follow-up MRI examination 8 months after surgery revealed a soft tissue lesion in the perianal tissue characterized as a recurrence of the disease, and stereotactic body radiotherapy (SBRT) was applied. Six months after SBRT follow-up examinations indicated a complete clinical response to radiotherapy without the recurrence of the primary disease. Stereotactic radiotherapy can be applied as an effective and safe ablative technique, particularly when considering the significant morbidity and impairment of the quality of life in patients after surgical treatment.

Keywords: *rectal cancer; SBRT; radiotherapy; perianal fistula; recurrence*

INTRODUCTION

Colorectal cancer is one of the most common malignant diseases worldwide. A multidisciplinary approach to the treatment involves the use of surgical therapy and chemotherapy, while radiotherapy is used in the treatment of rectal cancer and tumors localized in the pelvis (1,2). Stereotactic radiotherapy (SBRT) allows the delivery of high, ablative radical radiotherapy doses to target volumes, in 1-5 fractions, with reduced risk to surrounding organs, making it suitable for irradiating localized disease foci (3). Locally recurrent perianal recurrences are often unsuitable for surgical resection due to high operative morbidity and significant impairment of the patients' quality of life, and SBRT may have a significant role in the treatment of such tumors.

CASE REPORT

A 59-year-old female patient S.M. presented to the doctor due to the appearance of a perianal fistula, accompanied by the presence of fecal content. Colonoscopy was performed, revealing a significant amount of necrotic content at the rectosigmoid junction, which prevented further examination. A biopsy was taken, and it histopathology confirmed a moderately differentiated adenocarcinoma. Magnetic resonance imaging (MRI) examination indicated a voluminous tumor lesion in the middle third of the sigmoid colon, with a diameter of over 8 cm, extending beyond the boundaries of the colon with infiltration of the posterior wall of the uterine corpus and left adnexa. The tumor infiltrated the perirectal connective tissue on the left side, giving rise to inflammatory collections manifested as a sizable pararectal abscess measuring over 4 cm in diameter. These collections communicated through wide, fistulous pathways with the skin in the perianal region, as observed. Tumor markers CEA and CA 19-9 were elevated, and abdominal MRI and thoracic CT scans ruled out disease dissemination to the organs of the mentioned regions. During the operation, a tumor was observed in the upper third of the rectum, which had infiltrated the uterus. Additionally, a fistulous tract to the perineum was found along the left lateral wall of the rectum, while the left lateral side of the rectum was adhered to the pelvic wall. The cecum and right colon were extremely dilated and with thin bowel wall. As a result of such intraoperative findings, the patient underwent surgery, involving a midline and lower laparotomy with a right hemicolectomy and an ileo-transverse anastomosis, Hartmann's procedure for rectal resection, terminal sigmoidostomy, hysterectomy with adnexectomy, swabbing of the fistulous canal and fistulectomy. The definitive histopathological finding confirmed a colorectal adenocarcinoma that infiltrated the left parametrium and cecum, with endoluminal protrusion, without lymphatic and perineural invasion, and out of the examined 62 lymph nodes, all were negative for malignancy. Although the resection margins were free, tumor tissue of adenocarcinoma was found in the histopathological material of the wall-biopsied fistula, leading the surgeon to consider treating the resection margins as R1 due to the presence of malignant cells in the fistulous canal. Chemotherapy was initiated according to the Folfox 4 regimen in eight cycles.

At the 4-month postoperative follow-up MRI of the abdomen and pelvis, and after the start of chemotherapy, there were no signs of local recurrence, nor signs of disease dissemination. At the next follow-up MRI, 8 months after surgery, there was a minor inflammato-

ry structure with a granulomatous appearance behind the anal canal, measuring 9x8x10mm in diameter, limited by a thick wall and filled with dense fluid, with the presence of an obliterated fistulous tract below the described structure. Rectoscopy was performed for further diagnosis, revealing a perianal fistulous opening measuring 2mm, with signs of granulation. Biopsy confirmed the presence of invasive adenocarcinoma grade two. Treatment continued with chemotherapy in three cycles according to the protocol with Capecitabine.

At the 1-year postoperative follow-up MRI of the small pelvis, interval enlargement of the diameter and volume of a soft tissue nodular lesion, located in the area of the apex of the fistulous canal, which did not make contact with the wall of the anal canal and was located about 1 cm behind the level of the posterior wall of the anal canal and 2 cm in front of the apex of the coccygeal bone, with the persistence of a scarred fistulous tract behind the anal canal, was described (Figure 1). Since the recurrence was localized in the pelvis, the tumor board indicated the implementation of preoperative chemoradiotherapy, but the complete filling of the pelvis with bowel loops was noted on CT simulation, preventing the delivery of pelvic chemoradiotherapy in the standard manner.

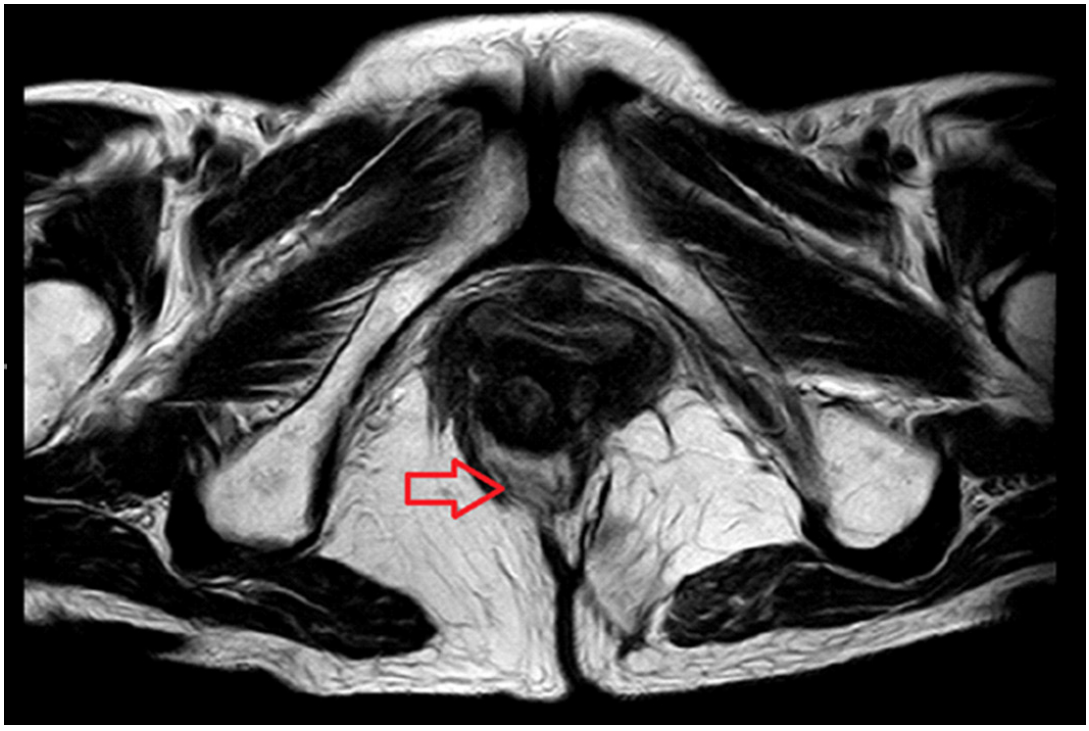

Figure 1. Progressive enlargement of the soft tissue lesion in the area of the tip of the fistulous canal on the T2-weighted MRI sequence.

Considering that surgical treatment would lead to significant morbidity, compromise the function of the anal sphincter, and impair the patient's quality of life, it was decided to apply one of the radiotherapy methods. A decision was made to perform SBRT of the local focus of the disease. CT simulation was performed with the patient positioned supine, with a comfortably full bladder and an empty rectum, with a slice thickness of 2mm (Figure 2).

Radiation therapy planning was performed in Eclipse software (Varian Medical Systems, Inc.). A dose of 30Gy was delivered in 5 fractions on the linear accelerator, with daily image-guided verification of the position using bony landmarks for the setup and management of intrafractional motion (Figure 3). The patient tolerated the radiation well, and the total planned dose was delivered without associated complications

An initial post-radiation MRI of the pelvis was performed 3 months after the radiotherapy, showing a significant post-therapy reduction in diameter and volume of the previously existing soft tissue nodule, in the connective tissue behind the anal canal (scar capsule with a diameter of up to 5 mm, and necrotic tissue up to 3 mm in diameter in its center), with no evidence of progressive disease at other sites. Follow-up MRI scans of the abdomen and pelvis did not indicate disease dissemination, and thoracic CT ruled out lung metastases. Tumor markers CEA and CA 19-9 were within reference limits. Colonoscopic examination showed no pathological changes. Six months after SBRT, the regression of the previously observed change was observed on follow-up MRI, with maturation of fibrous tissue of the fistulous canal and persistence of the previously observed small nodular change in the central part of the scarred tract, with a diameter of about 3 mm, bordered by a fibrous capsule. Follow-up endoscopic, imaging, and laboratory examinations did not indicate disease dissemination. The patient remained subjectively asymptomatic and able to work throughout. It was de-

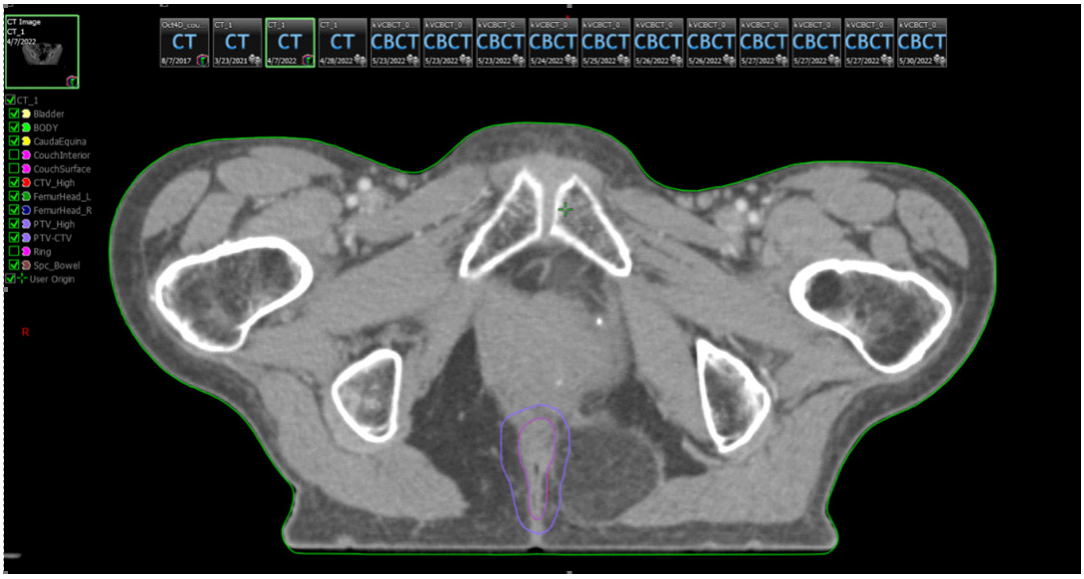

Figure 2. Delineation of the target volume on a transverse axis.

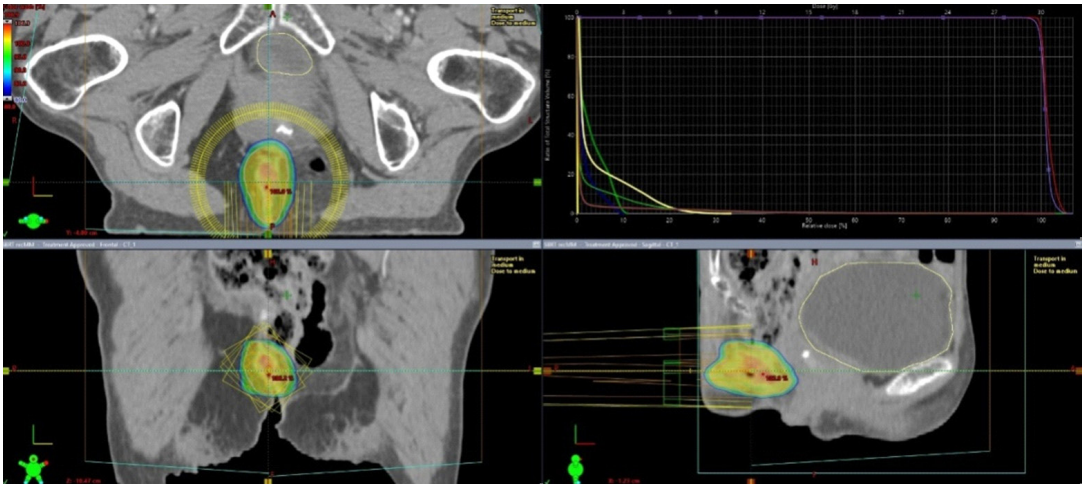

Figure 3. Radiation therapy plan with a dose-volume histogram.

cided to continue the regular follow-up of the patient according to the colorectal cancer protocol. Discussion Stereotactic body radiotherapy (SBRT) is a local ablative radiotherapy method that delivers highly precise and high doses of ionizing radiation to tumor tissue, typically in a small number of fractions (usually 1-5). For many years, it has been used in the treatment of recurrent tumors at various locations, making SBRT a therapeutic option for treating localized recurrent colon and rectal cancer (4). Although the possibility of the radical surgical treatment of recurrence remains the most important factor for survival, performing curative resection is often challenging due to altered anatomical planes and tissue fibrosis resulting from primary resection and/or radiotherapy (5,6). For this reason, stereotactic ablative radiation therapy has advantages in such patients, as it leads to lower morbidity while preserving the patient's quality of life, primarily manifested in preserving the anal sphincter function. High-dose SBRT, including one or several fractions, can achieve tumor ablation with efficacy similar to that achieved by surgery, especially for small lesions (7).

In the case of our patient, performing preoperative chemoradiotherapy with standard pelvic radiotherapy was not possible due to complete pelvic filling with bowel loops on CT simulation and a high risk of developing unacceptable complications of this type of radiation therapy. The goal of pelvic chemoradiotherapy would have been prophylactic irradiation of locoregional lymphatics with a boost of the tumor dose to the soft tissue nodule, aiming to prevent tumor recurrence. Surgical treatment was planned after chemoradiotherapy; however, given the extent of the primary operation, it was evident that any surgical treatment would entail a significant risk of postoperative morbidity and the loss of the anal sphincter function. Therefore, considering the patient's agreement and the reasons mentioned above, both chemoradiotherapy and surgical treatment were abandoned.

There is limited literature on the use of SBRT for re-

current colorectal cancer, as it has mainly been used as a method of choice for oligometastatic colorectal cancer, particularly for metastases located in the liver and lungs (8,9). The review of the literature has shown that SBRT for liver metastases offers a high rate of local disease control (up to 90% at 2 years) and satisfactory overall survival (up to 70% at 2 years) with low toxicity (10). The prospective TORCH-R study investigated the use of hypofractionated radiotherapy combined with chemotherapy and immunotherapy in patients with a local recurrence of rectal cancer with or without oligometastases. Doses of 25-40 Gy in 5 fractions were applied to patients who were not previously irradiated, and doses of 15-30 Gy in 5 fractions were applied to previously irradiated patients. The aim of this ongoing two-cohort, phase II trial is to investigate the efficacy and safety of incorporating immunotherapy into the treatment regimen for patients with locally recurrent rectal cancer, combining hypofractionated radiotherapy, chemotherapy, and immunotherapy, with the primary endpoint being the local objective response rate (11).

In recent years, the criteria for SBRT application have been specified, primarily for the treatment of the oligometastatic disease, which includes patients with controlled primary tumors, favorable histology, good performance status, and, in the case of metastatic disease, a limited number of metastases, usually less than 5 (12-14). There are different recommendations and variations in SBRT fractionation (15). In our patient's case, a dose of 30 Gy in 5 fractions over a one-week period was prescribed to optimize local tumor control by achieving a high dose in the tumor itself while maintaining a mean dose of 30 Gy and respecting the dose constraints of neighboring organs at risk. Preclinical studies examining the effectiveness of different doses and fractionation regimens have shown that higher doses per fraction increase the immune stimulation effect, cause greater DNA damage, lead to increased micronucleus formation, and produce more IFN-I in irradiated tumor cells, resulting in significant inhibition of tumor cell growth compared to standard fractionation regimens. However, the possibility of applying high tumor doses primarily depends on the proximity and tolerance of surrounding healthy tissues to avoid complications that could significantly compromise the patient's quality of life. In our patient's case, the proximity of the skin and anal sphincter were limiting factors for escalating the tumor dose. Nevertheless, the applied dose achieved the expected therapeutic effect without accompanying complications (16,17).

This case report illustrates that the use of SBRT for recurrent rectal cancer can produce a good, stable, and long-lasting response in patients.

CONCLUSION

Stereotactic radiotherapy can be applied as an effective and safe ablative technique, especially when there is a significant morbidity and impairment of the quality of life of patients after surgical treatment for recurrent carcinoma localized in perianal and perirectal tissues. This method represents a good alternative to surgical treatment, providing excellent local disease control while maintaining a high quality of life for the patients' post-treatment.

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