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CASE REPORT

Turning the tide: combined resection and radiofrequency ablation of synchronous liver metastases in colorectal cancer

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Summary
Colorectal cancer (CRC) frequently metastasises to the liver, where multimodal therapy offers the best survival outcomes. We report a 45-year-old woman with rectosigmoid adenocarcinoma and synchronous liver metastases who showed an excellent response to neoadjuvant chemotherapy, evidenced by tumour marker decline and radiologic regression. She underwent single-stage colorectal and hepatic resection (HR) with intraoperative radiofrequency ablation. Follow-up imaging confirmed complete metabolic remission and nine months of disease-free survival. This case underscores the effectiveness of integrated systemic therapy and parenchymal-sparing hepatic surgery in synchronous colorectal liver metastasis.
Keywords: colorectal cancer, liver metastasis, neoadjuvant chemotherapy, radiofrequency ablation, metastasectomy

Case report

A 45-year-old woman with a diagnosis of rectosigmoid adenocarcinoma and synchronous liver metastases (Figure 1) was referred to our clinic. On admission and following full assessment for definitive diagnosis of liver metastasis, the patient was scheduled for surgical management after receiving neoadjuvant chemotherapy. The prescribed chemotherapy regimen was as follows: On day 1, oxaliplatin was given at a dose of 85 mg/m² by intravenous infusion together with leucovorin 400 mg/m² intravenously, followed immediately by a bolus of 5-fluorouracil 400 mg/m² intravenously and then a continuous infusion of 5-fluorouracil 2400 mg/m² over 46 hours. This regimen was typically repeated every 14 days for a total of 4 to 8 cycles. The values of serum tumour markers including CA125 and CEA were assessed before and after neoadjuvant chemotherapy, indicating marked decline. Magnetic resonance imaging (MRI) and fluorodeoxyglucose (FDG)-positron emission tomography/

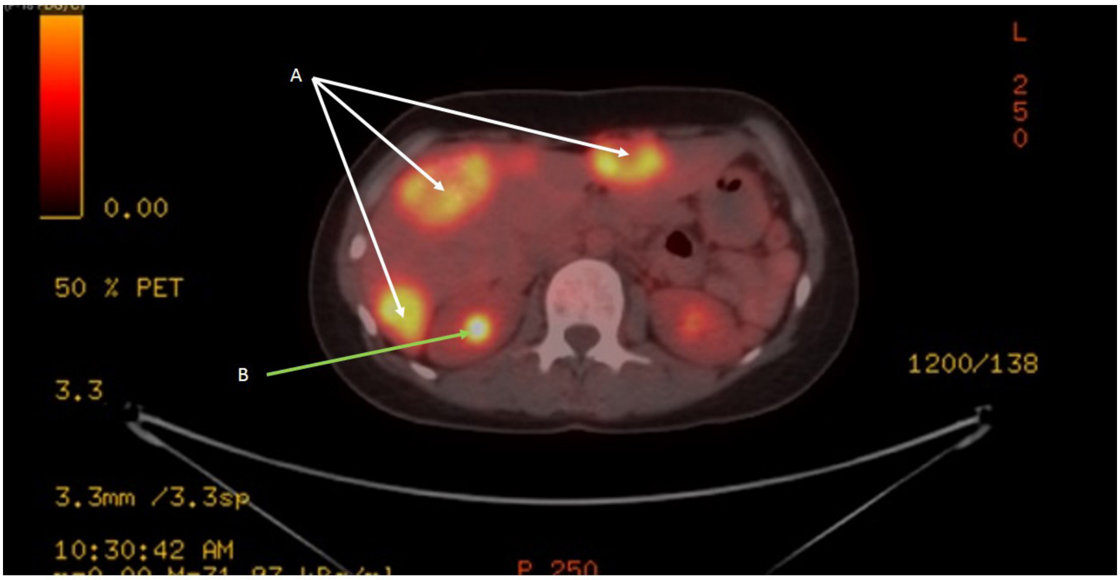

Figure 1: Axial FDG-PET/CT scan pre-neoadjuvant chemotherapy. This image demonstrates three metastatic deposits (wide white arrows) (A) and contrast in the right kidney (wide green arrow) (B)

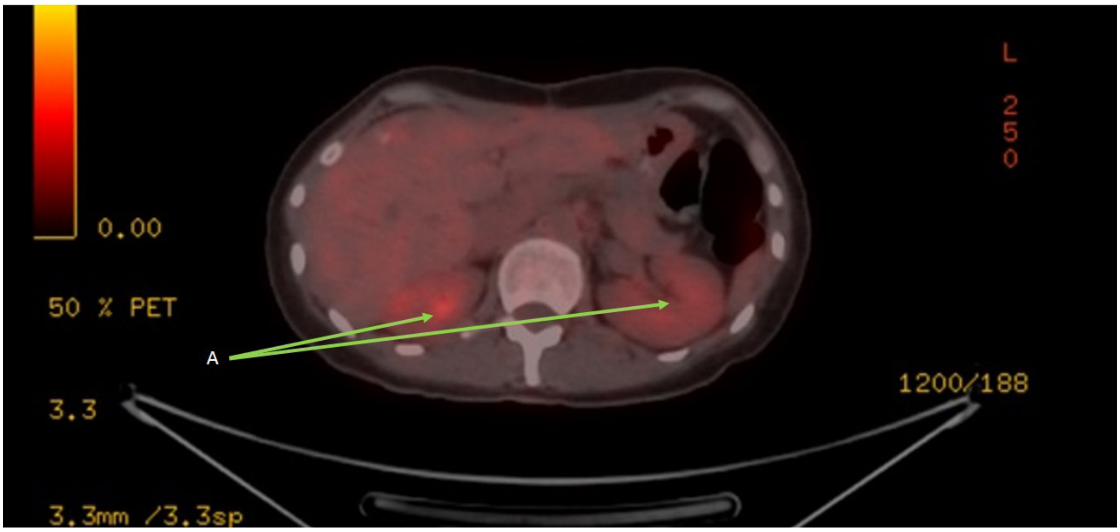

Figure 2: Axial FDG-PET/CT scan post-neoadjuvant chemotherapy. This image demonstrates completed resolution of the three metastatic deposits and feint contrast in both kidneys (wide green arrows) (A)

computed tomography (FDG-PET/CT) scans obtained before and after neoadjuvant chemotherapy were compared, demonstrating a reduction in both the size and metabolic activity of the primary tumour and hepatic metastases (Figure 2). In January 2025, the patient underwent a single-stage surgical procedure consisting of a low anterior resection of the primary tumour, followed by metastasectomy of all surgically accessible peripheral lesions located at segment 2, 3, and 6. After liver metastasectomy was completed for peripheral lesions, intraoperative radiofrequency ablation (RFA) was performed for lesions located deep within the hepatic parenchyma. The lesions were detected intraoperatively, using intraoperative ultrasound and surgical exploration to identify metastases located deep within the hepatic parenchyma. The bowel resection margins were histologically free of tumour. The resection margins of the hepatic metastasectomy specimens were also clear of tumour involvement, and ablated lesions demonstrated no residual viable tumour on follow-up imaging. Following surgical resection, the patient received adjuvant chemotherapy including FOLFOX regimen (12 cycles [every 2 weeks]) as Oxaliplatin 85 mg/m² intravenously plus Leucovorin 400 mg/m² intravenously and 5-FU 400 mg/m² intravenously bolus, followed by 2400 mg/m² continuous infusion over 46 hours. FDG-PET/CT examinations performed in May and September 2025 revealed a disease-free interval of approximately nine months after adjuvant chemotherapy. The patient continues under close surveillance and ongoing treatment.

Discussion

Surgery for CRC with synchronous liver metastases represents a unique challenge in oncologic surgery.[1] Approximately 15–25% of cases with CRC present with liver metastases at the time of diagnosis, and among them, a small subset exhibits a solitary hepatic lesion.[2] The presence of liver metastases offers a unique opportunity, as aggressive multimodal treatment may lead to long-term survival or indeed cure.[3] In the era of ultramodern systemic treatment and advanced surgical techniques, the optimal operation of these cases requires a personalised, multidisciplinary approach integrating oncologic, hepatic, and specialised considerations.[4]

Our patient presented with synchronous liver metastases that demonstrated significant regression following neoadjuvant chemotherapy. This response reflects the role of neoadjuvant chemotherapy in down-sizing metastatic liver deposits, thus permitting complete surgical resection.[5] Current evidence suggests that preoperative chemotherapy, generally with oxaliplatin or irinotecan, combined with targeted agents, such as bevacizumab or cetuximab (depending on rat sarcoma [RAS] mutation status), can lead to partial or indeed complete radiologic responses in a proportion of cases.[6] The decision-making process in this case was guided by the balance between oncologic radicality and preservation of liver function. Parenchymal-sparing hepatectomy, when attainable with negative margins, has surfaced as the preferred strategy to minimise postoperative morbidity and preserve hepatic function.

The complete radiological response of a metastatic deposit on imaging – known as “fading liver metastasis” – poses a surgical dilemma, as this does not necessarily translate to a pathological complete response. Occult malignant cells frequently persist despite radiologic retrogression.[7]

From a surgical perspective, resection of a solitary metastasis, especially after regression following neoadjuvant chemotherapy, requires precise localisation and complete resection of the original metastatic point.[8] In this setting, adequate oncologic clearance is necessary. The goal is to achieve a complete (R0) resection, meaning no cancer cells are visible under the microscope at the edges of the removed tissue (the margins). In rectal cancer, this typically involves a total mesorectal excision (TME) to remove the tumour along with its surrounding fascia, which contains the lymph nodes. The goal is a minimum of 1–2 cm margin from the primary tumour to ensure a negative margin.[9] Intraoperative ultrasonography remains an essential tool to identify residual disease, delineate surgical perimeters, and plan parenchymal-sparing resections.[10] If the lesion is no longer radiographically visible, including with intraoperative ultrasonography, resection of the previously noted metastatic deposit is generally recommended. In this regard, the entire “footprint” of the previously noted lesion is resected via a wedge resection to prevent local recurrence; this management strategy is essential because residual microscopic disease may survive chemotherapy. Local thermal ablation (such as RFA or microwave ablation) is administered to ensure the destruction of any residual viable cells where a traditional clear surgical margin (R0) is no longer feasible due to tumour shrinkage or the lesion is difficult to resect.[11]

For cases with synchronous liver metastases, the timing of colorectal and HRs – whether contemporaneous or "liver-first" – depends on multiple factors which include tumour burden, patient performance status, and institutional policies. Contemporaneous resection has gained momentum for cases with limited hepatic disease and acceptable physiological reserve, reducing hospitalisation time without compromising oncologic issues.[12]

Notwithstanding the short follow-up period, our case underscores the significance of a personalised, multidisciplinary approach in managing synchronous liver metastases from CRC, particularly when radiologic regression occurs after neoadjuvant chemotherapy. Careful surgical planning, integration of intraoperative imaging, and parenchymal-sparing resection are vital to achieving long-term control. Continued collaboration between oncologists, radiologists, and hepatobiliary surgeons is essential to optimise issues in this evolving paradigm.

In the management of synchronous colorectal liver metastases (CRLM), the current standard of care would include either two-stage or simultaneous resection of the primary tumour and the liver metastases. Nevertheless, for selected patients, especially the elderly or those with substantial comorbidities who would not be ideal candidates for major liver resection, RFA is currently being recognised as a potential alternative to formal HR for local management of the liver disease. As suggested by emerging evidence, RFA appears to provide equivalent prognostic outcomes to HR in the management of CRLM for these selected patient populations. Moreover, RFA may also be considered as part of a simultaneous procedure together with the resection of the primary tumour, where the liver metastases are also managed in a single surgical setting, although there appears to be a current paucity of data on the use of RFA in this simultaneous setting for synchronous CRLM. [13]

The place of liver transplantation (LT) in the management of multiple synchronous liver metastases from CRC is very selective and mainly experimental, limited to those with unresectable liver disease but without extrahepatic disease.[14] These patients would typically have a controlled primary CRC, metastases too extensive for standard hepatectomy (often proven by a high tumour burden or involvement of key liver structures), but most importantly, no evidence of disease outside the liver or peritoneum. They would also need to show chemosensitivity to systemic therapy, often requiring neoadjuvant chemotherapy to reduce tumour burden and prove tumour sensitivity prior to LT, which would then be undertaken as a combined procedure with primary tumour resection, or shortly thereafter, in an attempt to eliminate all malignant cells when standard surgical resection is not possible.[15]

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

The authors declare that this submission is in accordance with the principles laid down by the Responsible Research Publication Position Statements as developed at the 2nd World Conference on Research Integrity in Singapore, 2010. Prior to commencement of the case write-up, informed consent was obtained from the patient.

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