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CASE REPORT

"*En bloc*" caudate lobe and inferior vena cava resection following cytoreductive surgery and hyperthermic intraperitoneal chemotherapy for peritoneal and liver metastasis of colorectal cancer

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Abstract

There are diverse protocols to manage patients with recurrent disease after primary cytoreductive surgery (CRS) with hyperthermic intraperitoneal chemotherapy (HIPEC) for peritoneal carcinomatosis. We describe a case of metachronous liver metastasis after CRS and HIPEC for colorectal cancer, successfully treated with a selective metastectomy and partial graft of the inferior vena cava. A 35-year-old female presented with a large tumour in the cecum and consequent colonic stenosis. After an emergency right colectomy, the patient received adjuvant chemotherapy. One year later she was diagnosed with peritoneal carcinomatosis, and it was decided to carry out a CRS/HIPEC. After 2 years of total remission, an isolated metachronous liver metastasis was detected by magnetic resonance imaging surveillance. The patient underwent a third procedure including a caudate lobe and partial inferior vena cava resection with a prosthetic graft interposition, achieving an R0 situation. The postoperative course was uneventful and the patient was discharged on postoperative day 17 after the liver resection. At 18-mo follow-up after the liver resection the patient

remained free of recurrence. In selected patients, the option of re-operation due to recurrent disease should be discussed. Even liver resection of a metachronous metastasis and an extended vascular resection are acceptable after CRS/HIPEC and can be considered as a potential treatment option to remove all macroscopic lesions.

Key words: Cytoreductive surgery; Liver resection; Hyperthermic intraperitoneal chemotherapy; Colorectal cancer; Liver metastasis

Core tip: Treatment of liver recurrence after a cytoreductive surgery and hyperthermic intraperitoneal chemotherapy is a great challenge. We report here the case of a young patient with metachronous liver metastases who was treated with a limited resection of segment I of the liver and vascular graft interposition of the inferior vena cava achieving a long-term survival. The surgical approach of these patients is extremely complicated and often requires complex major surgical procedures.

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INTRODUCTION

Peritoneal carcinomatosis (PC) is the second most common presentation of metastatic colorectal cancer and is diagnosed in up to 4%-6% of these cases. Twenty five percent of these patients have the peritoneum as the only site of disseminated disease[1]. PC was traditionally considered the last stage of the disease and was associated with a poor prognosis so that patients were often relegated to palliative systemic therapies. In recent decades multimodal PC treatment has made great advances; cytoreductive surgery (CRS), hyperthermic intraperitoneal chemotherapy (HIPEC) and systemic chemotherapy have shown promising results and have become standard therapy for PC patients in several countries[2-7]. Various studies have reported that patients undergoing CRS with total macroscopic cytoreduction and HIPEC may achieve prolonged overall survival and potentially even a complete cure in selected patients[4,8,9].

Up to 80% of patients with PC of colorectal origin treated with CRS and HIPEC are likely to recur[10,11]. In selected cases the possibility of a reoperation due to recurrence or even an extensive abdominal surgical procedure can be individually assessed. The data available on this approach show favourable long-term outcomes with similar morbidity and mortality to that of initial CRS/HIPEC[12-15]. Simultaneous or staged combined CRS and liver resections have also been performed with comparable morbidity and long-term results[16]. In this report we describe the case of a young female patient with metachronous liver metastasis after CRS and HIPEC for colorectal cancer successfully treated by a selective liver and vascular resection.

CASE REPORT

A 35-year-old female was referred to our emergency unit in February 2011, presenting with abdominal distension, pain, and vomiting for 3 d. Her medical history was only remarkable for asthma. Abdominal computed tomography (CT) was performed and revealed a large tumor in the cecum with consecutive colonic stenosis. The patient underwent an emergency right colectomy, and an R0 situation was achieved. Pathologic examination showed pT4a pN2a (4/22) cM0 poorly differentiated adenocarcinoma. Between March and August 2011 she received 12 cycles of adjuvant FOLFOX (folinic acid, 5-fluorouracil, and oxaliplatin). In February 2012 a CT scan identified lesions in the peritoneum with suspicions of peritoneal carcinomatosis. Our multidisciplinary tumour board decided on pursuing CRS with HIPEC. Abdominal exploration revealed widespread peritoneal carcinomatosis, especially in the pelvis and a large tumor mass in the left sub-diaphragmatic region with a peritoneal cancer index (PCI) of 14. Total parietal and diaphragmatic peritonectomy, proctocolectomy with an end ileostomy, terminal ileum resection, splenectomy, omentectomy, hysterectomy and bilateral salpingo-oophorectomy (CCR-0) were performed to remove the macroscopic tumor. HIPEC was carried out to treat the microscopic residual with mitomycin C, according to the closed-abdomen technique. The postoperative course was uneventful and the patient was duly discharged from hospital. At this time, no further chemotherapy was recommended as the patient had completed adjuvant chemotherapy after the first operation and a R0 situation was achieved. Adjuvant systemic chemotherapy, according to our institution protocols, is performed only in chemo naïve patients. From February 2012 until June 2014 the patient stayed free from recurrence. In July 2014 abdominal magnetic resonance imaging (MRI) surveillance revealed a solid tumor in segment 1 of the liver (Figure 1) so the patient underwent explorative laparotomy. During the procedure no evidence of a peritoneal recurrence was shown but many adhesions were found from the previous operations. A 4 cm tumor was identified in the caudate hepatic lobe infiltrating the inferior vena cava (IVC). The distal cava was mobilized towards the left renal vein and was divided at a level free of tumor

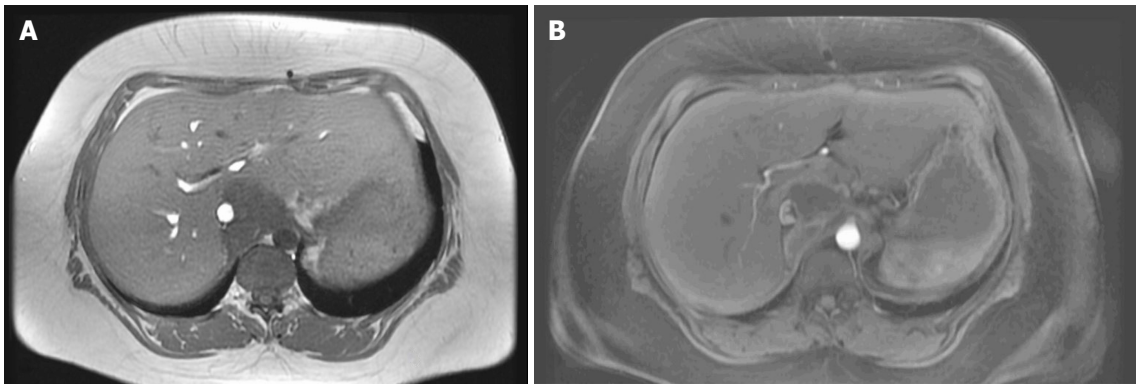

Figure 1 Magnetic resonance imaging shows an isolated liver metastasis in caudate lobe of the liver.

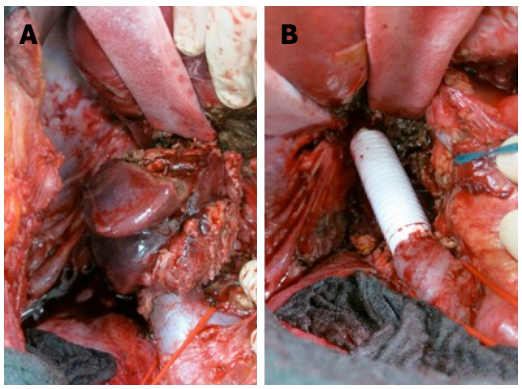

Figure 2 Distal inferior vena cava. A: Tumor mass infiltrating the inferior vena cava (ICV) at the bifurcation of the renal veins (vessel loop); B: Vascular interposition graft after partial resection of the IVC.

(Figure 2A). Liver segment 1 was transected following the clamp-crushing technique and ICV cranial to the tumor was dissected and divided under the major suprahepatic trunks. Vascular continuity was restored using a prosthetic graft interposition sutured with a running suture of prolene 5/0 onto the proximal and distal IVC (Figure 2B). The postoperative course was mainly uncomplicated except for right pleural effusion, initially managed conservatively with diuretic therapy, and later by thoracocentesis. The patient was finally discharged on the 17th postoperative day. Pathological examination revealed a poorly differentiated adenocarcinoma with identical immunohistochemical phenotype as previously. At this point it was decided not to continue with chemotherapy, as a CCR-0 situation had been surgically achieved and the patient had completed the 12-cycle adjuvant treatment in the past (Table 1). Eighteen months after metastasis resection of the liver and 4 years after CRS and HIPEC, the patient shows no evidence of neoplastic disease.

DISCUSSION

After initial CRS and HIPEC, recurrences are mostly intra-abdominal, even if complete cytoreduction is achieved[17]. Protocols differ among the different institutions, thus a number of different treatments are applied in high-volume centres, including chemotherapy, tumour debulking or re-do surgery for intraadominal metastasis.

The presence of synchronous liver metastases (LM) and PC was traditionally a contraindication for cytoreductive surgery. However, it has been shown that selected patients with low PCI and three or fewer LM can achieve prolonged survival if a liver resection is performed simultaneously[16,18]. A recent meta-analysis by Cuba *et al*[19] shows improved overall survival (OS) in patients who were treated with CRS and HIPEC and curative treatment of LM as compared to patients treated with modern systemic chemotherapy alone.

Nevertheless, it remains unclear which approach should be used in patients with isolated metachronous LM, as in our case report. Iterative cytoreductive surgery is feasible in cases of recurrence and appears to be worthwhile in terms of long-term outcomes[20]. The study by Sugarbaker and colleagues was on one of the largest series and included 70 patients with PC of colorectal origin[15]. This study showed that 53% of the patients had at least one reoperation after the initial cytoreduction. The overall survival of patients with repeated surgery approach was significantly longer (39 mo *vs* 20 mo). Brouquet *et al*[13] reported on a cohort of 20 patients with repeat CRS + intraperitoneal chemotherapy (IPC) for isolated peritoneal tumour recurrence of all origins. Five- and 10-year overall survival (OS) rates were 72.5% and 58.1% respectively.

Even though they studied selected groups of patients, the studies by Sugarbaker and Brouquet underline the possibility of highly favourable outcomes and even long-term survival in palliative patients with recurrence of peritoneal carcinomatosis.

In this context, the study by Kianmanesh *et al*[12] included 43 patients with PC of colorectal cancer origin who underwent CRS/HIPEC and specifically evaluated the role of simultaneous liver resection. They concluded that patients with colorectal PC, iterative CRS and HIPEC achieved appreciable long-term survival and that liver metastasis resection did not negatively influence the postoperative outcomes. However, they

Table 1 History and detail surgical treatment of our patient's disease

Time point	Diagnosis	Procedure
2011	Stenotic tumour of the cecum	Right Colectomy
		Adjuvant chemotherapy (12 cycles with folinic acid, 5-fluorouracil, and oxaliplatin)
2012	Peritoneal carcinomatosis	CRS (CCR-0)
	PCI = 14	Total parietal and diaphragmatic Peritonectomy
		Proctocolectomy with end ileostomy
		Terminal ileum resection
		Splenectomy
		Omentectomy
		Hysterectomy
		Bilateral salpingo-oophorectomy
		HIPEC
		43.8 mg Mitomycin C intraperitoneal (1 h)
2014	Liver metastases segment Ⅰ with ⅣC infiltration	Resection of liver segment Ⅰ
		Partial resection of ⅣC with prosthetic graft interposition
		Cholecystectomy
		Partial adrenalectomy
2016	No evidence of neoplastic disease	

PCI: Peritoneal cancer index; CRS: Cytoreductive surgery; HIPEC: Hyperthermic intraperitoneal chemotherapy.

did not specify whether an extended vascular resection was performed or if liver resections were performed in cases of metachronous LM.

Achieving complete cytoreduction in most cases is challenging and implies an aggressive approach combining major surgical procedures not exempt from complications. In selected cases, as in the one presented here, the option of re-do surgery for liver metastasis is feasible. Even extended vascular resection is acceptable after CRS/HIPEC and can be considered as a potentially curative treatment option. Early detection of tumour recurrence through a close follow-up is essential, as well as a multidisciplinary assessment of patient selection. The patients should then be referred to a centre specialized in the treatment of peritoneal and liver metastases. In the present case, staged resection of both metastatic sites achieved long-term survival for a young female patient. To our knowledge, this is this first report on liver resection due to metachronous liver metastases following CRS and HIPEC.

COMMENTS

Case characteristics

A 35-year-old patient with liver recurrent disease after an extended cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (HIPEC) procedure.

Clinical diagnosis

Abdominal magnetic resonance imaging (MRI) diagnosed the liver recurrence in the follow-up.

Differential diagnosis

There is no possible differential diagnosis in this case.

Laboratory diagnosis

All labs were within normal limits.

Imaging diagnosis

MRI showed a solid tumor in segment 1 of the liver.

Pathological diagnosis

pT4a pN2a (4/22) cM0 poorly differentiated adenocarcinoma.

Treatment

Complete surgical excision of lesion.

Related reports

There are currently no other reports of surgical excision of a liver metastasis in the caudate lobe two years after a cytoreductive surgery.

Experiences and lessons

The report is good example of patient tailored treatment in cases where guidelines are missing or suggest only palliative or best supportive care. It is also novel to perform such an extensive surgery after cytoreductive surgery and HIPEC.

Peer-review

The paper is well written.

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