Since 2002

Surgical Management of Liver Metastases from Colorectal Cancer: A Single-Surgeon Preliminary Findings Report

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Abstract

BACKGROUND: Colorectal cancer is a significant medical and social problem. Approximately half of the patients with colorectal carcinoma develop liver metastasis. Most commonly, they are identified during the diagnostic process or the initial surgery. After the diagnostics, only 15% of the cases are referred to receive radical surgery. Liver resection in patients with hepatic metastases is the only way to improve their survival.

AIM: The objective of the study was to introduce a surgical strategy used for the treatment of colorectal liver metastases.

MATERIALS AND METHODS: The study included 539 patients who underwent surgery for colorectal carcinoma in the Department of Surgery at University Hospital "Kaspela" during the period 2014–2020. These data were collected from the patients' disease history.

RESULTS: Of the 539 patients with colorectal carcinoma, 74 (13.7%) were diagnosed with synchronous liver metastases. In 38 (51.3%) of the cases, the metastases were solitary, of which 21 were removed simultaneously and 17 at the follow-up stage. In 8 (10.8%) cases, more than 1 (2–3) solitary metastasis was established near the edges. They were also removed simultaneously. In 6 patients (8.1%), bilobar and peripherally localized solitary lesions were found, which were removed instantly and chemotherapy was administered. In 22 (29.7%) of the patients with multiple bilobar metastases, only a biopsy was performed, and surgery was carried out only in those affected by chemotherapy.

CONCLUSION: The possibilities of simultaneous and stepwise liver resections were expanded by focusing on individual approach preferences and improving diagnostic methods, liver surgery techniques, and modern chemotherapy.

Introduction

Colorectal cancer is a major medical and social issue. It ranks third in the global structure of malignant neoplasms and is one of the leading causes of death in both sexes. Approximately half of all colorectal cancer patients develop liver metastases. They are most commonly discovered during the diagnostic process or during the initial surgery [1]. When the diagnosis is defined, only 15% of the patients are suitable for radical surgery [2]. In patients with metastases, liver resection is the only option for improving survival. Research shows that the overall 5-year survival period increased from 8% in the chemotherapy-only group to 25–40% in the surgery group due to advancements in treatment through a multimodal approach [1], [3]. The aim of this article is to introduce a surgical strategy for the treatment of colorectal liver metastasis.

Materials and Methods

We performed a retrospective analysis of existing data from the Institutional Register of Hepatic Surgery at University Hospital "Kaspela" in Plovdiv, Bulgaria. The data included 539 colorectal cancer patients who underwent surgery between 2014 and 2020. Metastases were considered synchronous when they were discovered concurrently with the diagnosis of colorectal cancer or before the primary focus was discovered, as well as when they were discovered incidentally during primary tumor resection.

Physical examination, blood samples for RBC, WBC count, coagulation status, and tumor markers were all used. Imaging methods included ultrasound followed by computed tomography (CT) and magnetic resonance (MRI) (Figure 1).

In cases where conventional surgery was performed, the hepatic resection was done first; whereas in laparoscopic cases, colorectal surgery was carried out first because of its infeasibility after extensive subcostal laparotomy for liver resection. During the surgery, meticulous exploration and intraoperative ultrasonography of the liver were performed routinely to rule out extrahepatic diseases and detect unsuspected liver metastases. Non-selective hepatic vascular exclusion techniques were used to decrease intraoperative blood loss.
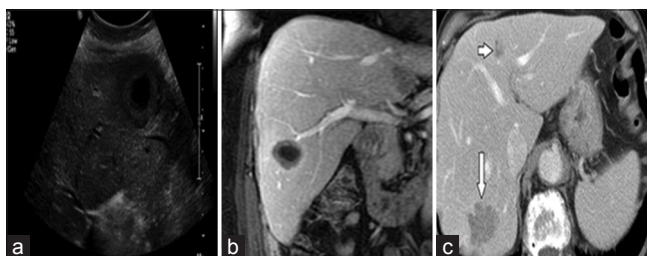
Figure 1: Ultrasound (a), magnetic resonance (b), and computed tomography (c) images of colorectal liver metastases

Results

Of the 539 patients operated for colorectal carcinoma, 74 (13.7%) were diagnosed with synchronous liver metastases. In 38 (51.3%) of the cases, the metastases were solitary, of which 21 (55.26%) were removed simultaneously and 17 (44.74%) during a secondary procedure because of poor performance status. In 8 (10.8%) of the patients, more than 1 single lobe metastasis had been detected and they were also simultaneously removed (Figure 2).

Figure 2: Metastasectomy and metastasectomy with atypical liver resection

Six (8.1%) of the cases were diagnosed with bilobar peripherally localized bigger solitary lesions that were instantly removed with subsequent adjuvant chemotherapy and re-evaluation of the liver status. In 22 (29.7%) of the procedures with multiple bilobar metastases, only a biopsy was done and radical surgery was performed in the patients influenced by the chemotherapy. In total, there were 33 atypical resections. In 30 of them, the tumor localization was in the left colon. All liver resections were conventional. In 28 of them, the colon/or rectal resection was laparoscopic and, subsequently, after its end, with the right subcostal incision extended to the left in a "hockey stick" fashion, the liver resection was performed. In

seven of the cases, we had open colorectal and liver surgery with a midline incision. In six of them, the tumor was localized in the right colon and in one in the sigmoid. Of 22 biopsy procedures, only two were taken during open procedures of the right colon (Table 1).

It was interesting when we compare indicators in the different management groups (Table 2). We found out n = 4 (19%) complications in simultaneous resection group, n = 3 wound infections treated by vacuum therapy, and one anastomotic leakage with resurgery, colostomy creation, unfortunately with lethal exit due to septically complications. The mean hospital stay was 11/7–21/days. Diseases recurrence in n = 7 patients and due to that n = 4 deaths for 3-year follow-up period. In the second group with more than 1 unilobar metastatic lesions, we registered n = 2 (25%) complications, one anastomotic leakage treated conservatively (ultrasound-guided drain placemen and antibiotic therapy) and one wound infection. The hospital stay was 10/8–18/days, n = 3 recurrences of the diseases and n = 4 patients deaths because of the disease.

In n = 6 cases with wedge resection due to bilobar lesions near the edge, we have n = 2 (33%) complications, one wound problem and also one bile leakage treated with ultrasound-guided drain placement. The hospital stay was 9/7–16/days, five of this patient has recurrent of the lesions, and three of them died in 3 years follow-up because of the disease.

In two-stage procedure group, we also have complications after colorectal surgery (CR), n = 4 anastomotic leakages, one of them treated with resurgery and colostomy, and the other conservatively, and one wound infection. The hospital stay after CR was 7/5–10/days. After second-liver surgery, we registered n = 1 wound infection and one bile leakage. For follow-up period, we have n = 5 patients with relapse of the disease and six patients death due to prime pathology.

In only liver biopsy group, we have n = 6 (27.2%) complications, one bleeding (from the biopsy area) treated conservatively, two anastomotic leakages that need resurgery and colostomy creation, and n = 3 septic wound complications. The mean hospital stay was 13/9–21/days, only three patients had second stage liver surgery after chemotherapy, and n = 18 patients died in 3 years due to the disease.

Table 1: Tumor characteristics

Solitary lesions (n = 21)	Unilobar lesions (n = 8)	Bilobar peripheral lesions (n = 6)	Multiple bilobar lesions (n = 22)
Atypical resection	Atypical resection	Atypical resection	Biopsy
⬇	⬇	⬇	⬇
Sigmoid colon (n = 9)	Sigmoid colon (n = 3)	Sigmoid colon (n = 3)	Sigmoid colon (n = 6)
Rectum (n = 6)	Right colon (n = 3)	Rectum (n = 3)	Rectum (n = 8)
Descending colon (n = 3)	Anatomical resection		Descending colon (n = 1)
Right colon (n = 3)	⬇		Right colon (n = 7)
	Right colon (n = 2)		

Table 2: Comparison of different types of management strategy

Surgery	Complications	Treatment	Hospital stay days	Reccurent of the diseases in 5 years	Patient deaths from disease	Surgery after neoadjuvant therapy
n = 21 single metastasis simultaneous resections	n = 3 wound complications n = 1 anastomotic leakage/rectal resection/ (total anastomotic dehiscence) exitus	Vacuum therapy Resurgery, ostomy, laparostomy	11/7–21/	n = 7 (33.3%)	n = 4 (19%)	
n = 8 unilobar >1 lesion, simultaneous resection	n = 1 wound complication n = 1 anastomotic leakage	Vacuum Conservative	10/8–18/	n = 3 (37.5%)	n = 4 (50.0)	
n = 6 bilobar metastasis wedge resections	n = 1 Wound complication	Vacuum	9/7–16/	n = 5 (83.3%)	n = 4 (66.67%)	
Two-stage procedure, n = 17 After colorectal (first surgery)	n = 1 Bile leakage n = 1 (first colorectal procedure) anastomotic leakage-total dehiscence of anastomosis n = 1 anastomotic leakage (partial dehiscence) n = 1 wound complication	Drainage Resurgery stoma Conservative treatment Vacuum therapy	7/5–10/			
After liver (second surgery)	n = 1 wound complications n = 1 Bile leakage	Vacuum therapy Drainage	9/10–17/	n = 5 (29.4%)	n = 6 (35.3%)	
n = 22 biopsies	n = 1 Bleeding n = 2 Anastomotic leakage, total dehiscence of anastomosis n = 3 wound complication	Conservative Resurgery stoma Vacuum therapy	13/9–21/		n = 18 (81.8%)	n = 3 (13.6%)

Discussion

We compare the results from our groups of patients with different types of pathology and surgical procedures and we have some interesting results. The shorter hospital stay was in a group with wedge resection due to bilobar metastasis, and of course the longest in the two-stage procedure, and logically, the complications rate is also higher in this group (33%). However, the most severe are the complications in liver biopsy cases and in single meth simultaneous resections. One of the important markers for every surgery – the recurrent rate, was highest in wedge resection cases, and lowest in two-stage group (p = 0.013). The disease-related deaths in 5 years follow-up are highest in biopsy group (81%) followed by bilobar wedge resection patients (66.67%). Patients with single metastases and simultaneous resection have better survival chance. These results are in agreement with few authors that provide analysis to the same topic such as Lee *et al*. and Feng *et al*. [4], [5].

Usually, for the detection of liver metastasis, all imaging methods are used. Ultrasound plays an important role as a screening method. It has the ability to detect liver lesions and to show their size and localization. The Doppler gives an opportunity for the evaluation of possible invasion of the blood vessels. Elastography is a new method that allows accurate differentiation between benign and malignant lesions.

The basic diagnostic method is computed tomography (CT). It is used to detect lesions, to establish their anatomical characteristics, and with the intravenous contrast it can clearly identify liver architectonics and tumor invasion to the large vessels, as well as to evaluate total liver volume and liver remnant volume for the prevention of liver failure. The disadvantage is the low diagnostic value for lesions smaller than 1 cm. Magnetic resonance imaging (MRI) is beneficial for diagnosing small lesions. It can locate them and define their position against blood and biliary vessels if a specific contrast agent is used. The PET scan significantly increases the sensitivity and specificity of the study [6], [7], [8].

The use of diagnostic laparoscopy enabled the avoidance of unnecessary laparotomy in up to 80% of cases in patients with advanced disease. It decreased the morbidity in the post-operative period, shortened the hospital stay, and the interval to initiate adjuvant chemotherapy. It is absolutely useful in patients in whom, despite the imaging and laboratory results, there are still doubts about tumor resectability and in cases where we suspect extrahepatic or peritoneal spread [9].

Pre-operative biopsy

The use of a fine-needle aspiration biopsy (FNA) allows the pre-operative histological classification of the tumor. Unfortunately, the frequency of falsely negative results is high, and taking into account, the possibility of tumor cell dissemination, this method is not preferable.

Hepatic resections

In recent years, with the improvement of diagnostic and surgical methods, increased experience in liver surgery, and the multimodal approach, we have significantly reduced the mortality rate in the early post-operative period and improved the 5-year survival in patients with colorectal liver metastases. As a result of this, the management of this disease is focused on surgical treatment [10].

Liver surgery involves resection of the tumor with a free margin and parenchyma preservation for possible future resections. This increasingly changes the types of liver resections from anatomical to parenchymal preserving, atypical and "wedge resections." Numerous studies have shown similar results for the 5-year survival rates for both techniques [11], [12], [13].

Diagnosis of synchronous liver metastases occurs in 20–30% of patients with colorectal carcinoma. There is no consensus yet about the volume during primary surgery in patients with CRC liver metastasis. Liver resection usually takes place after a period of 12–16 weeks.

Most surgeons currently perform simultaneous resections in the presence of the right-sided CRC and solitary lesions, whereas in the presence of the left-sided CRC and/or multiple metastatic lesions, they leave the liver resection for a second stage. Numerous studies have shown that there is no difference in perioperative morbidity and mortality in patients with simultaneous and two-stage resections. An advantage has been found in simultaneous resections for disease control and the possibility of adjuvant chemotherapy and the achievement of better control over micrometastases. At present, there are no contraindications to simultaneous liver resections in CRC patients. The limiting factors are the experience of the surgical team, the residual parenchyma, and the patient's performance status [14].

Two-stage liver resections are used in patients in whom the radical resection of all liver metastases would lead to liver failure. In these cases, the removal of the maximum number of lesions is recommended but with sufficient liver remnants, especially in patients with previous liver diseases or chemotherapy. In the second stage, after chemotherapy, radical resection is performed, counting on "down staging" and regeneration of the hepatic parenchyma and sufficient future liver remnants [15], [16].

The use of ultrasound-guided liver surgery enabled an accurate identification of the tumor location and its relationship to the major blood vessels, which made it possible to preserve them and avoid major resections, that is, excessive loss of hepatic parenchyma. This method is particularly well suited for colorectal liver metastases and has an advantage over two-stage liver resections due to an increased liver remnant volume, which allows for future resections in the event of relapses, as well as a low post-operative morbidity rate [17], [18], [19].

The selection of the patient candidates for liver resection is based on the principles of oncosurgery and the possibility of preserving at least 30% residual normal liver parenchyma. The total count of hepatic metastases, their intraparenchymal location, and the presence of extrahepatic extension are no longer accepted as exclusion criteria. The decision to perform simultaneous or stepwise resection depends on the surgeon. When a synchronous disease is established, simultaneous resection should be performed if the tumor can be removed and the surgery is technically feasible by the team. Even low rectal resections can be done safely together with major liver resections. The comorbidity and the performance status of the patient are contraindications for simultaneous resections [20].

Conclusion

With the improvement of diagnostic methods, liver surgery techniques, modern chemotherapy, and by focusing on the individual approach, the possibilities of simultaneous and stepwise liver resections are increased. When the liver metastases from colorectal cancer are detected during primary surgery, the decision for liver resection is determined by the surgeon's experience, the respectability, and the volume of potential residual parenchyma.

Ethical Statement

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Institutional Review Board Statement

The study was approved by the Institutional Review Board of Kaspela University Hospital-Plovdiv (IRB No: 2020-01-04). Informed consent was obtained from all subjects involved in the study.

Informed Consent Statement

Written informed consent was obtained from all subjects involved in the study for voluntary participation and reporting the data in scientific publications.

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