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ABOUT COVER

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The primary aim of *World Journal of Gastrointestinal Oncology* (*WJGO*, *World J Gastrointest Oncol*) is to provide scholars and readers from various fields of gastrointestinal oncology with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGO mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal oncology and covering a wide range of topics including liver cell adenoma, gastric neoplasms, appendiceal neoplasms, biliary tract neoplasms, hepatocellular carcinoma, pancreatic carcinoma, cecal neoplasms, colonic neoplasms, colorectal neoplasms, duodenal neoplasms, esophageal neoplasms, gallbladder neoplasms, *etc.*

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Retrospective Cohort Study

Multidisciplinary discussion and management of synchronous colorectal liver metastases: A single center study in China

Hao Li, Guo-Li Gu, Song-Yan Li, Yang Yan, Shi-Dong Hu, Ze Fu, Xiao-Hui Du

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The multidisciplinary team (MDT) has been carried out in many large hospitals now. However, given the costs of time and money and with little strong evidence of MDT effectiveness being reported, critiques of MDTs persist.

AIM

To evaluate the effects of MDTs on patients with synchronous colorectal liver metastases and share our opinion on management of synchronous colorectal liver metastases.

METHODS

In this study we collected clinical data of patients with synchronous colorectal liver metastases from February 2014 to February 2017 in the Chinese People's Liberation Army General Hospital and subsequently divided them into an MDT+ group and an MDT- group. In total, 93 patients in MDT+ group and 169 patients in MDT- group were included totally.

RESULTS

Statistical increases in the rate of chest computed tomography examination ($P = 0.001$), abdomen magnetic resonance imaging examination ($P = 0.000$), and preoperative image staging ($P = 0.0000$) were observed in patients in MDT+ group. Additionally, the proportion of patients receiving chemotherapy ($P = 0.019$) and curative resection ($P = 0.042$) was also higher in MDT+ group. Multivariable analysis showed that the population of patients assessed by MDT meetings

had higher 1-year [hazard ratio (HR) = 0.608, 95% confidence interval (CI): 0.398-0.931, $P = 0.022$] and 5-year (HR = 0.694, 95%CI: 0.515-0.937, $P = 0.017$) overall survival.

CONCLUSION

These results proved that MDT management did bring patients with synchronous colorectal liver metastases more opportunities for comprehensive examination and treatment, resulting in better outcomes.

Key Words: Synchronous colorectal liver metastases; Multidisciplinary team; Imaging examination; Treatment strategy; Oncological outcome

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Core Tip: Synchronous colorectal liver metastases usually predict a poor prognosis. Nevertheless, given the costs of time and money and with little strong evidence of multidisciplinary team (MDT) effectiveness being reported, critiques of MDTs still persist. This study demonstrates that MDT management brings patients more opportunities for aggressive examination and treatment. Retrospective clinical data shows that the population of patients assessed by MDT meetings has higher 1-year and 5-year overall survival.

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INTRODUCTION

Colorectal cancer is the second most commonly diagnosed cancer, with an estimated 1.78 million cases occurring in 2020 [1]. About 50% of patients with colorectal cancer will suffer distant metastases; the liver is the most common site. In particular synchronous liver metastases account for 15%-25% of colorectal liver metastases [2]. Synchronous colorectal liver metastases are usually defined as liver metastases detected at or before primary colorectal cancer. Curative resection is identified as the most effective method for curing synchronous colorectal liver metastases. However, data showed only 5%-15% patients with synchronous liver metastases were curable with resection [3,4], 5-year survival rates of patients with unresectable liver metastases were starkly lower, at less than 5% respectively [5].

The multidisciplinary team (MDT) originated in the United Kingdom in the 1960s and 1970s [6] and is defined as a regularly scheduled discussion of patients, especially those diagnosed with cancer, comprising professionals from different specialties [7]. After years of development, MDTs have been used in most large hospitals and are recommended by most guidelines on cancer therapy [8]. Nevertheless, given the costs of time and money and with little strong evidence of MDT effectiveness being reported, critiques of MDTs persist [9,10].

On a positive note, many retrospective and prospective studies have already provided clinical evidence in favor of MDT meetings with regard to diagnosis, tumor staging, treatment strategy, and oncological outcomes of cancer including colorectal cancers [11-13]. However, few reports have shown the impact of MDT meetings on synchronous colorectal liver metastases. In this study, we undertook a retrospective analysis of the impact of MDT meetings on the clinical data of patients with synchronous colorectal liver metastases, and we provide our insights on management of synchronous colorectal liver metastases in an MDT model.

MATERIALS AND METHODS

This retrospective study incorporated patients who were diagnosed with synchronous colorectal liver metastases from February 2014 to February 2017 in the Chinese People's Liberation Army General Hospital. All patients in the MDT group (MDT+) were discussed by the gastrointestinal cancer MDT of the Chinese People's Liberation Army General Hospital and had thorough records in minutes of the meetings. Patients without discussion at MDT meetings (MDT-) were treated by doctors with equivalent qualifications of the Chinese People's Liberation Army General Hospital. This study received approval from the ethics commission of the General Hospital of People's Liberation Army.

Data collection

Patients with uncertain diagnoses and medical records were excluded, as were patients suffering from extrahepatic metastases or other severe disease that might affect survival time seriously. These patients were followed up for 66 mo in this study. A total of 169 patients in MDT- group (80 men and 89 women; mean age: 60.15 years) and 93 patients in MDT+ group (53 men and 40 women; mean age: 59.19 years) were ultimately included in this study.

To analyze the impact of MDT on overall survival (OS), we compiled the following items in our data collection according to previous studies[14-17]: (1) Demographic data: Age, gender, body mass index; (2) Cancer characteristics: Site of primary tumor, primary lymph node (LN) involvement, multiple liver metastases, extrahepatic metastases; (3) Baseline examination including imaging data and serum carcinoembryonic antigen (CEA) levels; (4) Detailed data about chemotherapy and surgery; and (5) Clinical data of follow-up until patients' death or the end of the follow-up period (August 2022). Data were mainly collected from the Electronic Medical Record of the Chinese People's Liberation Army General Hospital, and those unavailable in the Electronic Medical Record were obtained from patients, in the form of copied records, imaging and laboratory data.

Statistical analysis

Continuous data are presented as median (range) unless indicated otherwise. Comparisons of differences in continuous variables between the two groups were performed with student's *t* test. Chi-square test and Fisher's exact method were carried out for categorical data. In the analysis of event-specific rates, patients were considered to be at risk of the studied event until death or the end of follow-up. Cumulative survival curves were plotted using the Kaplan-Meier method and statistically compared using the log-rank test. Univariate and multivariate survival analysis was performed using the Cox proportional hazards model, with results presented as a hazard ratio (HR) with a 95% confidence interval (CI). Univariate and multivariate logistic analysis was performed using the likelihood ratio test, with results presented as an odds ratio (OR) with a 95%CI. Multivariate analysis included items with univariate analysis results of $P < 0.20$. Statistical significance was set at $P < 0.05$. All analyses were performed using the Statistical Program for Social Sciences 26.0 software (SPSS, Inc., Chicago, IL, United States).

RESULTS

Patient

A total of 262 patients were included in this study. The clinical characteristics of patients are detailed in [Table 1](#). In MDT+ group, a significant 80.65% of patients (75 out of 93) were diagnosed with liver metastases at more than one site. Interestingly, the proportion of patients in MDT- group was 79.88% ($P = 0.989$). No significant differences in demographic data and cancer characteristics were observed between these two groups.

Baseline imaging examination and radiological tumor-node-metastasis staging

The rate of chest computed tomography (CT) examination in patients in MDT+ group was significantly higher than that in MDT- group (100% vs 82.84%, $P = 0.001$). This trend was mirrored in the rate of abdomen magnetic resonance imaging (MRI) (100% vs 73.96%, $P = 0.000$). As radiological tumor-node-metastasis (TNM) staging was routinely required in our gastrointestinal cancer MDT meeting, all patients in MDT+ group had been diagnosed with TNM staging. However, only 20.12% of patients were evaluated with radiological TNM staging in MDT- group ($P = 0.000$). No significant difference in positron emission tomography-CT (PET-CT) between the two groups was observed ($P = 0.906$). Baseline imaging examination and radiological TNM staging results are represented in [Table 2](#).

Oncology treatment and surgery

Of 17 patients in MDT+ group were diagnosed with initial resectable synchronous colorectal liver metastases. 77 patients in the MDT+ group and 116 patients in MDT- group received chemotherapy (82.80% vs 68.64%, $P = 0.0191$). Approximately 10% of these chemotherapy patients were successfully converted to be radically resectable after several chemotherapy cycles. At the end of the follow-up period, 30 patients in MDT+ group and 35 patients in MDT- group had undergone curative resection (32.29% vs 20.71%, $P = 0.0415$). Statistical differences were not observed in the proportion of initial resectable liver metastases, and successful conversion chemotherapy between the two groups. Oncology treatment and surgery is outlined in [Table 3](#).

OS

The 1-year OS rate of all 262 patients was determined to be 54.58%. There was a significant difference between the two groups, with patients in MDT+ group demonstrating statistically higher 1-year OS rates than those in MDT- group (66.67% vs 47.93%; $P = 0.0036$, [Figure 1](#)). Univariate analysis employing the Cox proportional hazards model, age > 75 years, CEA > 5 ng/mL, primary LN involvement, multiple liver metastases, extrahepatic metastases, curative resection, MDT, and chemotherapy were associated with 1-year OS rates at $P < 0.20$ ([Table 4](#)).

Subsequent multivariate analysis illuminated that age > 75 years (HR = 2.276, 95%CI: 1.419-3.649, $P = 0.001$), CEA > 5 ng/mL (HR = 5.139, 95%CI: 3.093-8.539, $P = 0.000$), Primary LN involvement (HR = 1.828, 95%CI: 1.073-3.116, $P = 0.027$), multiple liver metastases (HR = 5.300, 95%CI: 1.627-17.262, $P = 0.006$), and extrahepatic metastases (HR = 6.187, 95%CI: 3.702-10.339, $P = 0.0001$) were high-risk factors. In contrast, MDT (HR = 0.608, 95%CI: 0.398-0.931, $P = 0.022$, [Figure 1A](#)) and curative resection (HR = 0.024, 95%CI: 0.003-0.177, $P = 0.000$) emerged as protective factors. During our analyses of 5-year OS rates, we found that despite the complexity of variables, MDT remained an independent protective factor (HR = 0.694, 95%CI: 0.515-0.937, $P = 0.017$, [Table 5](#) and [Figure 1B](#)).

Table 1 Demographic and clinical characteristics of patients

Characteristics	MDT+ (n = 93)	MDT- (n = 169)	P value
Age (yr), mean (min-max)	59.19 (28.00-89.00)	60.15 (25.00-92.00)	0.605
Male/female, n	40/53	89/80	0.172
BMI (kg/m ²), mean (min-max)	24.83 (17.29-33.82)	23.62 (16.06-33.5)	0.221
KPs score ≥ 60	89/12	150/19	0.095
Adenocarcinoma/mucinous adenocarcinoma, n	83/10	143/26	0.393
Poor differentiation, n (%)	16 (17.20)	21 (12.43)	0.380
Primary tumor category ≥ T3, n (%)	67 (72.04)	135 (79.88)	0.197
Primary LN involvement, n (%)	60 (64.52)	118 (69.82)	0.458
Multiple liver metastases, n (%)	75 (80.65)	134 (79.29)	0.920

BMI: Body mass index; KPs: Karnofsky performance status; LN: Lymph node; MDT: Multidisciplinary team.

Table 2 Baseline imaging examination and radiological tumor-node-metastasis staging

	MDT+ (n = 93)	MDT- (n = 169)	P value
Chest CT, n (%)	93 (100)	140 (82.84)	0.001
Abdomen MRI, n (%)	89 (95.70)	125 (73.96)	0.000
PET-CT, n (%)	22 (23.66)	47 (27.81)	0.906
TNM staging, n (%)	93 (100)	34 (20.12)	0.000

CT: Computed tomography; MRI: Magnetic resonance imaging; PET: Positron emission tomography; TNM: Tumor-node-metastasis; MDT: Multidisciplinary team.

Table 3 Oncology treatment and surgery

	MDT+ (n = 93)	MDT- (n = 169)	P value
Initial resectable, n (%)	17(18.285)	21 (12.43)	0.270
Successful conversion chemotherapy, n (uninitial resectable, n)	13 (76 ¹)	14 (148 ¹)	0.148
Chemotherapy, n (%)	77 (82.80)	116 (68.64)	0.019
Curative resection, n (%)	30 (32.29)	35 (20.71)	0.042
Simultaneous resection, n (%)	29 (97.63)	19 (55.88)	0.001
RFA, n (%)	5 (16.67)	15 (44.12)	0.036

¹Values in parentheses are numbers of patients with unresectable liver metastases.

RFA: Radiofrequency ablation; MDT: Multidisciplinary team.

DISCUSSION

In MDT+ group, a significant majority of patients underwent a chest CT examination (100% vs 82.84%, $P = 0.001$). A SEER-based study including 46027 colorectal cancer patients found that about 20% of patients with colorectal liver metastasis were diagnosed with lung metastases simultaneously[16]. Furthermore, resection of liver and lung metastases brings better oncological outcomes than resection of liver metastases only[18]. Thus, the high frequency of chest CT examinations observed in the MDT+ group aligns with the need for comprehensive diagnostics in the management of patients with synchronous colorectal liver cancer. Moreover, the rate of abdomen MRI examination was significantly higher in MDT+ group compared to the MDT- group ($P = 0.000$), indicating a greater focus on identifying patients with questionable or curatively resectable liver metastases[19,20]. Most cancer therapy guidelines and clinical research underscore the importance of TNM staging in informing treatment strategies, reinforcing the value of accurate preoperative radiological TNM staging in treatment planning and monitoring clinical efficacy. Moreover, researchers

Table 4 Univariate and multivariate analyses of risk factors associated with 1-year overall survival

	n (%)	Univariate			Multivariate		
		HR	95%CI	P value	HR	95%CI	P value
Age > 75	61 (23.28)	3.533	2.44-5.11	0.000	2.065	1.257-3.393	0.004
Sex (male)	133 (50.76)	0.845	0.590-1.211	0.358			
BMI > 28	46 (17.56)	0.765	0.468-1.250	0.285			
CEA > 5 ng/mL	125 (47.71)	7.296	4.674-11.391	0.000	5.308	3.262-8.638	0.000
Colon primary	118 (45.04)	1.283	0.896-1.838	0.174	1.058	0.724-1.544	0.772
Mucinous adenocarcinoma	36 (13.74)	0.863	0.502-1.482	0.593			
Poor differentiation	37 (14.12)	1.282	0.793-2.073	0.311			
Primary tumor category ≥ T3	202 (77.10)	1.284	0.820-2.009	0.274			
Primary LN involvement	178 (67.94)	3.336	2.061-5.400	0.000	1.948	1.156-3.281	0.012
Multiple liver metastases	210 (80.15)	13.97	4.44-43.97	0.000	4.747	1.470-15.333	0.009
MDT	93 (35.50)	0.53	0.353-0.801	0.003	0.572	0.374-0.874	0.010
chemotherapy	193 (73.66)	0.239	0.166-0.344	0.000	0.874	0.539-1.418	0.587
Curative resection	67 (25.57)	0.016	0.002-0.114	0.000	0.031	0.004-0.227	0.001

HR: Hazards ratio; CI: Confidence interval; BMI: Body mass index; CEA: Carcinoembryonic antigen; MDT: Multidisciplinary team; LN: Lymph node.

Table 5 Univariate and multivariate analyses of risk factors associated with 5-year overall survival

	n (%)	Univariate			Multivariate		
		HR	95%CI	P value	HR	95%CI	P value
Age > 75	61 (23.28)	3.471	2.532-4.758	0.000	2.040	1.322-3.149	0.001
Sex (male)	133 (50.76)	0.938	0.721-1.221	0.938			
BMI > 28	46 (17.56)	0.951	0.679-1.331	0.769			
CEA > 5 ng/mL	125 (47.71)	2.446	1.872-3.195	0.000	2.516	1.847-3.428	0.000
Colon primary	118 (45.04)	1.349	1.035-1.757	0.027	0.828	0.622-1.102	0.195
Mucinous adenocarcinoma	36 (13.74)	0.792	0.529-1.184	0.256			
Poor differentiation	37 (14.12)	1.102	0.758-1.603	0.611			
Primary tumor category ≥ T3	202 (77.10)	0.969	0.710-1.322	0.841			
Primary LN involvement	178 (67.94)	1.567	1.175-2.088	0.002	1.143	0.835-1.566	0.404
Multiple liver metastases	210 (80.15)	3.852	2.592-5.725	0.000	2.563	1.671-3.932	0.000
MDT	93 (35.50)	0.667	0.504-0.884	0.005	0.709	0.527-0.954	0.023
Chemotherapy	193 (73.66)	0.203	0.147-0.281	0.000	0.591	0.388-0.900	0.014
Curative resection	67 (25.57)	0.091	0.058-0.144	0.000	0.111	0.069-0.178	0.000

HR: Hazards ratio; CI: Confidence interval; BMI: Body mass index; CEA: Carcinoembryonic antigen; MDT: Multidisciplinary team; LN: Lymph node.

have also proved that preoperative tumor staging increased cancer-specific endpoints[21]. Therefore, the increased likelihood of comprehensive baseline examination in patients under the MDT model can significantly contribute to more effective cancer treatment planning. For patients with synchronous liver metastases, PET-CT examination was frequently selected as the diagnostic modality of choice[22]. Notably, a substantial 80% of patients in the MDT+ group received chemotherapy ($P = 0.019$). A study from Phelip *et al*[23] indicated that a multidisciplinary meeting was the only factor independently associated with administration of chemotherapy.

Within the MDT+ group, patients were categorized into two subgroups: Those initially deemed resectable and those considered potentially resectable. Despite ongoing controversies surrounding the use of neo-adjuvant therapy for patients

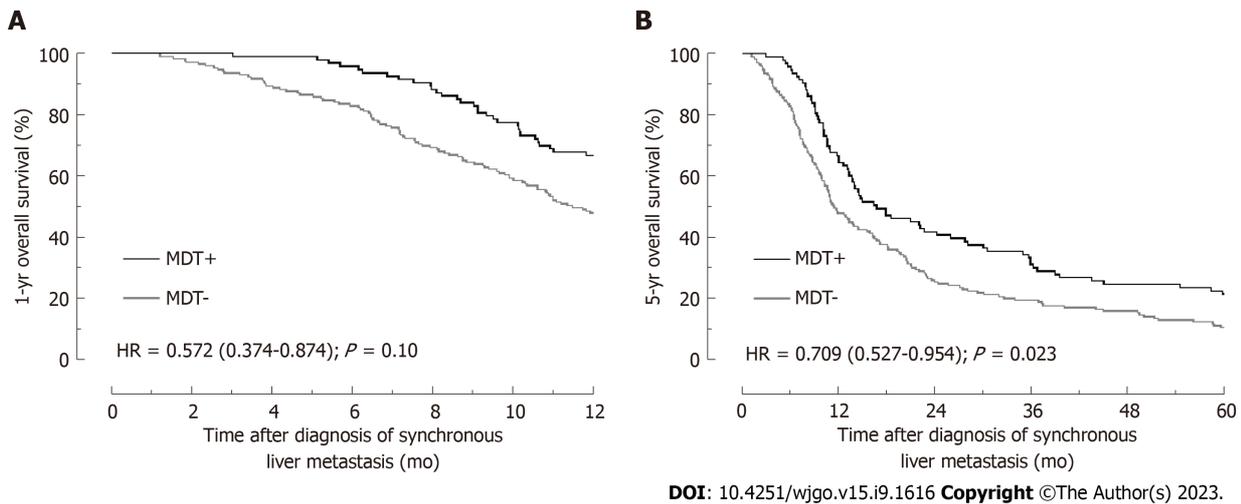


Figure 1 Overall survival comparison: Multidisciplinary team (+) group versus multidisciplinary team (-) group. A: Multidisciplinary team was a protective factor for 1-year overall survival rates; B: Multidisciplinary team was a protective factor for 5-year overall survival rates. MDT: Multidisciplinary team; HR: Hazard ratio.

with initially resectable synchronous liver metastases[24-28], several benefits of neo-adjuvant therapy can be identified. Firstly, neo-adjuvant chemotherapy provides a “window period” that allows for the observation of any new unresectable liver metastases, thereby preventing unnecessary operations[29]. Secondly, neo-adjuvant therapy can potentially increase the chances of R0 surgery and the volume of residual liver post-surgery[30,31]. Thirdly, combining neo-adjuvant chemotherapy with adjuvant chemotherapy may enhance the outcomes of patients undergoing curative surgery[32,33]. Given these benefits, we often advocate for neo-adjuvant therapy, especially for patients with large liver metastases and large number of liver metastases or suspicious LN metastases. However, the status of the primary tumor lesion, patient willingness, chemotherapy toxicity and risk of disease progression should still be considered[26].

Successful conversion is an important goal for potentially resectable patients, while the symptoms and tumor burden usually influence the treatment strategy for unresectable patients. Large clinical trials have reported that the rates of successful conversion of unresectable liver metastases were about 4%-15%[34,35]. We observed a similar proportion (17.11% in MDT+ group and 9.46% in MDT- group) in our study. Research showed that the resection margin width of liver metastases was independently associated with OS rates[36]. However, complete radiological response only contributed 15%-70% of complete pathological response, and even among patients with a complete pathological response, long-term remission occurred in only 20%-50% of those treated with systemic therapy[37]. For patients who convert to be curatively resectable, we advocate for immediate curative resection, given the hepatotoxicity and potential for decreased chemosensitivity associated with prolonged chemotherapy. As the macroscopic disease disappears on preoperative imaging, an excision extension according to the baseline imaging data is recommended.

Despite the significantly higher 5-year OS rates of resectable colorectal liver metastasis (37%-49%) in contrast to unresectable liver metastases(2%-4%)[5,38,39], only about 10% of patients in our study were diagnosed as initially resectable. Given these stark contrasts, the pursuit of resectability remains crucial. We typically discourage palliative excision of liver metastases, yet for patients who lose the opportunity for curative resection due to primary tumor complications, we do advocate for the R0 resection of liver metastases[40]. Over 90% of patients underwent simultaneous combined laparoscopic resection in MDT+ group. Simultaneous liver and colorectal resections for metastatic colorectal cancer are associated with similar long-term cancer outcomes compared with staged procedures[41,42]. Considering factors such as operation duration, blood loss, hospital stay, and morbidity[43,44], patients can benefit much more from simultaneous operations. While long-term outcomes like overall survival, progression-free survival, and local recurrence after excision radio frequency ablation (RFA) remain contentious[45,46], we usually prefer excision unless specialists in our MDT meeting agree that excision is a great risk or complete ablation of liver metastases with RFA is possible. In our MDT, intraoperative RFA was performed by doctors from the department of intraoperative ultrasound. And only 5 of 30 patients in MDT+ group received RFA.

In the last part of this study, after adjusting for variables like age, primary LN involvement, multiple liver metastases, extrahepatic metastases, and curative resection, we discovered that MDT meetings were a protective factor for 1-year OS (HR = 0.608, 95%CI: 0.398-0.931, $P = 0.022$, Table 4) and 5-year OS (HR = 0.694, 95%CI: 0.515-0.937, $P = 0.017$, Table 5). Patients may achieve this *via* the improvement of patients' treatment compliance, accurate radiological TNM staging, and an increased proportion of curative resection and systemic therapy in the MDT model.

CONCLUSION

The successful operation of a MDT necessitates fixed members, consistent meeting time, and location, an academic secretary with a medical background, and chat software enabling constant communication among team members. An

MDT can help mitigate incomplete decisions made by individual doctors. Nonetheless, further evidence is still needed to confirm these benefits and assess the clinical benefits in light of the time and financial costs.

ARTICLE HIGHLIGHTS

Research background

Multidisciplinary teams (MDTs) have been implemented in numerous large hospitals; however, critiques persist due to the high costs and limited strong evidence of their effectiveness.

Research motivation

The motivation behind this article is to provide further evidence on the application of MDTs in the field of colorectal liver metastasis. By conducting this research, we aim to contribute to the existing knowledge base and enhance the understanding of how MDTs can effectively improve patient outcomes in this specific context.

Research objectives

The objective of this study is to evaluate the effects of MDTs on patients with synchronous colorectal liver metastases and provide insights and recommendations on the management of synchronous colorectal liver metastases.

Research methods

This retrospective study investigated the influence of MDT involvement on clinical data of patients with synchronous colorectal liver metastases at the Chinese People's Liberation Army General Hospital.

Research results

The analysis revealed significant statistical increases in the rates of chest computed tomography examination ($P = 0.001$), abdomen magnetic resonance imaging examination ($P = 0.000$), and preoperative image staging ($P = 0.0000$) among patients in the MDT+ group. Furthermore, a higher proportion of patients in the MDT+ group received chemotherapy ($P = 0.019$) and underwent curative resection ($P = 0.042$). Multivariable analysis demonstrated that patients assessed through MDT meetings had higher 1-year overall survival [hazard ratio (HR) = 0.608, 95% confidence interval (CI): 0.398-0.931, $P = 0.022$] and 5-year overall survival (HR = 0.694, 95%CI: 0.515-0.937, $P = 0.017$).

Research conclusions

The findings of this study provide evidence that MDT management offers patients with synchronous colorectal liver metastases increased access to comprehensive examinations and treatments, ultimately leading to improved outcomes.

Research perspectives

This study conducted from the perspective of surgeons through a retrospective analysis of clinical records, observed that MDT management offers increased opportunities for comprehensive examinations and treatments in patients with synchronous colorectal liver metastases, consequently leading to improved treatment outcomes. This further validates the benefits of MDT management.

FOOTNOTES

Author contributions: Li H and Du XH were the guarantor of integrity of entire study, and contributed to the study concepts; Li H, Gu GL, Li SY, and Du XH designed the study; Li H, Gu GL, Li SY, and Hu SD involved in the literature research; Li H and Fu Z contributed to the data acquisition; Li H contributed to the statistical analysis/interpretation and manuscript preparation; Li H, Gu GL, Li SY, Hu SD, and Du XH contributed to the manuscript definition of intellectual content; Li H, Gu GL, and Du XH edited the manuscript.

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