

Synchronous resections of primary colorectal tumor and liver metastasis by laparoscopic approach

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Abstract

Liver metastasis of colorectal cancer is common. Resection of solitary tumors of primary and metastatic colorectal cancer can have a favorable outcome. Open resection of primary colorectal tumor and liver metastasis in one operation or in separate operations is currently common practice. Reports have shown that synchronous resections do not jeopardize short or long-term surgical outcomes and that this is a safe and effective approach in open surgery. The development of laparoscopic colorectal surgery and laparoscopic hepatectomy has made a minimally invasive surgical approach to treating colorectal cancer with liver metastasis feasible. Synchronous resections of primary colorectal tumor and liver metastasis by laparoscopy have recently been reported. The efficacy and safety of laparoscopic colorectal resection and laparoscopic hepatectomy have been proven separately but synchronous resections by laparoscopy are in hot debate. As it has been shown that open resection of primary colorectal tumor and liver metastasis in one operation results in an equally good short-term outcome when compared with that done in separate operations, laparoscopic resection of the same in one single operation seems to be a good option. Recent evidence

has shown that this new approach is a safe alternative with a shorter hospital stay. Large scale randomized controlled trials are needed to demonstrate the effectiveness of this minimally invasive approach.

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Key words: Colorectal cancer; Hepatectomy; Laparoscopic; Liver resection; Simultaneous; Synchronous

Core tip: Open resection of primary colorectal tumor and liver metastasis in one operation or in separate operations is currently common practice but synchronous resections of the same by laparoscopy are controversial. Since open resection of primary colorectal tumor and liver metastasis in one operation results in an equally good short-term outcome when compared with that done in separate operations, laparoscopic resection of the same in one single operation seems to be a good option. Recent evidence has shown that this new approach is a safe alternative with a shorter hospital stay. Large scale randomized controlled trials are needed to demonstrate its effectiveness.

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OVERVIEW

Colorectal cancer (CRC) is the third commonest cancer and the fourth leading cause of cancer deaths in the world. In 2008, there were around 50000 deaths related to CRC in the United States alone. Around 25% of CRC patients have stage IV disease upon presentation^[1]. CRC metastasizing to the liver is common. Evidence has

shown that resection of solitary metastatic tumors of CRC can have a favorable outcome^[2]. With the use of sophisticated imaging systems, such as high resolution contrast computed tomography and positron emission tomography, the sensitivity of detection of liver metastases larger than 2 cm is as high as 90%^[3,4]. Open resection of primary colorectal tumor and liver metastasis in one operation or in separate operations is currently common practice^[5,6]. Improved chemotherapies and biological agents have made many previously unresectable tumors resectable^[7]. Reports have shown that synchronous resections do not jeopardize short or long-term surgical outcomes and that this is a safe and effective approach in open surgery^[8-11].

Like laparoscopic hepatectomy, laparoscopic colorectal surgery has become popular in recent years because of its absolute advantage of allowing fast return of bowel motion and a shorter hospital stay^[12-15]. More recently, synchronous resections of primary colorectal tumor and liver metastasis by laparoscopy have been reported^[16-19]. Since the complication rate of synchronous resections is generally higher, as documented by Slesser *et al.*^[20], careful patient selection is important. Contrast computed tomography and positron emission tomography can provide accurate disease staging. Laparoscopy is not suitable for very bulky tumors. Although major resection by laparoscopy is feasible, the patient would not benefit from a small incision as a relatively large wound must be created for retrieval of the resected tumor.

Approximately 25% of CRC patients have concurrent liver metastasis on presentation. Liver is the most common site of hematogenous dissemination. Contemporary management of CRC calls for multidisciplinary involvement. Positron emission tomography using ¹⁸F-fluorodeoxyglucose can provide very accurate staging of disease, enabling surgeons to achieve an R0 resection with curative intention^[21]. Novel chemotherapeutic agents used in target therapy are effective in causing remarkable tumor response^[22,23]. Nonetheless, viable cancer cells can still be present after chemotherapy despite extensive tumor necrosis^[5] and hence, chemotherapy should not replace resection. After all, resection of primary and metastatic tumors is the best way to maximize patient survival.

TECHNIQUES

Laparoscopic synchronous resections of primary colorectal tumor and liver metastasis are normally carried out under general anesthesia. The patient is placed in a supine position with Trendelenburg adjustment. A 12 mm port is created using the open method. Pneumoperitoneum is introduced by insufflation of CO₂ and the intra-abdominal pressure is maintained at 12 cm H₂O. Another two 12 mm ports and two 5 mm ports are made under direct vision. Standard diagnostic and staging laparoscopy is then conducted. The liver is examined with laparoscopic ultrasound to confirm the extension of the tumor and its relationship to the hepatic vasculature^[12-14]. It is preferred

that resection of the colorectal tumor is conducted first to make sure that the primary tumor is resectable before any metastatic tumor is to be resected. Moreover, conducting colorectal resection before hepatic resection can avoid bowel edema, a condition that makes anastomosis difficult, caused by the Pringle maneuver. The colon or rectum is mobilized with an ultrasonic dissector and the mesenteric artery and vein are controlled with clips. For a rectal tumor, the rectum is transected with an endoscopic linear stapler^[24]. Intracorporeal colorectal anastomosis is performed with a circular stapler. A laparoscopic anterior resection usually takes 2 h or so^[15]. For hepatic resection, the no-touch technique can be used. The area to be transected is marked by diathermy. Transection of the liver parenchyma can be done with a Cavitron ultrasonic surgical aspirator and a Harmonic scalpel. The margin from the lesion is ideally 1 cm and is marked by intraoperative ultrasound. Both the primary and metastatic tumors are retrieved with protection through an incision with size similar to the largest diameter of the tumors^[13]. Routine hepatic inflow control may not be necessary. A laparoscopic minor hepatectomy usually takes 2-3 h and a major one usually takes 6-8 h^[14].

CONSIDERATIONS

Short-term benefits of laparoscopic surgery for CRC have been proven by randomized controlled trials^[25-29]. Emerging evidence also shows that the laparoscopic approach does not compromise patient survival^[30,31]. As it has been shown that open resection of primary colorectal tumor and liver metastasis in one operation results in an equally good short-term outcome when compared with that done in separate operations^[20], laparoscopic resection of the same in one single operation seems to be a good option. The obvious advantage of laparoscopic surgery is small surgical incisions. With improvements of laparoscopic equipment, the present high definition feature of most monitoring units provides magnificent magnification of the operation field. The margin of resection is thus not compromised even although the operation is conducted through a very small opening^[32-34].

The risk of hemorrhage is an important concern when conducting hepatic resection on patients who have received chemotherapy treating their primary cancer and the location of liver metastasis can be a challenge in laparoscopic hepatic resection. Careful interpretation of the liver anatomy displayed by preoperative high-resolution imaging and intraoperative ultrasonography helps to avoid injury to the major hepatic vein, enabling safety of laparoscopic hepatic resection in difficult locations^[35]. Careful use of the Cavitron ultrasonic surgical aspirator followed by application of clips helps to reduce blood loss. Strict control of the central venous pressure with careful administration of intravenous fluid and an intra-abdominal pressure of 12 to 15 mmHg contributes to minimal oozing of blood during liver transection^[14]. The Pringle maneuver can be easily applied to the liver

hilum in the laparoscopic approach but a routine Pringle maneuver is not encouraged as it tends to cause venous congestion and thus leakage of anastomoses.

Both colorectal resection and hepatic resection are complicated operations. Whether combining these two complicated procedures in one laparoscopic surgery will do patients more harm or good is in hot debate. However, synchronous resections of primary colorectal tumor and liver metastasis by laparoscopy are not only feasible but also safe. Therefore, this approach is an alternative to open resection in one or separate operations for selected patients, especially when minimally invasive surgery is desired. Large-scale randomized controlled trials are needed to demonstrate the effectiveness of this minimally invasive approach.

REFERENCES

- 1 **Parkin DM**, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. *CA Cancer J Clin* 2005; **55**: 74-108 [PMID: 15761078 DOI: 10.3322/canjclin.55.2.74]
- 2 **Cook AD**, Single R, McCahill LE. Surgical resection of primary tumors in patients who present with stage IV colorectal cancer: an analysis of surveillance, epidemiology, and end results data, 1988 to 2000. *Ann Surg Oncol* 2005; **12**: 637-645 [PMID: 15965730 DOI: 10.1245/ASO.2005.06.012]
- 3 **Lu YY**, Chen JH, Ding HJ, Chien CR, Lin WY, Kao CH. A systematic review and meta-analysis of pretherapeutic lymph node staging of colorectal cancer by 18F-FDG PET or PET/CT. *Nucl Med Commun* 2012; **33**: 1127-1133 [PMID: 23000829 DOI: 10.1097/MNM.0b013e328357b2d9]
- 4 **Cheung TT**, Ho CL, Lo CM, Chen S, Chan SC, Chok KS, Fung JY, Yan Chan AC, Sharr W, Yau T, Poon RT, Fan ST. 11C-acetate and 18F-FDG PET/CT for clinical staging and selection of patients with hepatocellular carcinoma for liver transplantation on the basis of Milan criteria: surgeon's perspective. *J Nucl Med* 2013; **54**: 192-200 [PMID: 23321459 DOI: 10.2967/jnumed.112.107516]
- 5 **Adam R**. Resection of non resectable liver metastases after chemotherapy: Prognostic factors and longterm results. *J Clin Oncol* (Meeting Abstracts) 2004; **22** Suppl 14: 3550
- 6 **Eadens MJ**, Grothey A. Curable metastatic colorectal cancer. *Curr Oncol Rep* 2011; **13**: 168-176 [PMID: 21298372 DOI: 10.1007/s11912-011-0157-0]
- 7 **Yau T**, Chan P, Ching Chan Y, Wong BC, Liang R, Epstein RJ. Review article: current management of metastatic colorectal cancer - the evolving impact of targeted drug therapies. *Aliment Pharmacol Ther* 2008; **27**: 997-1005 [PMID: 18363897 DOI: 10.1111/j.1365-2036.2008.03684.x]
- 8 **Nanji S**, Cleary S, Ryan P, Guindi M, Selvarajah S, Grieg P, McGilvary I, Taylor B, Wei A, Moulton CA, Gallinger S. Up-front hepatic resection for metastatic colorectal cancer results in favorable long-term survival. *Ann Surg Oncol* 2013; **20**: 295-304 [PMID: 23054102 DOI: 10.1245/s10434-012-2424-1]
- 9 **Stojanović M**, Stanojević G, Radojković M, Zlatić A, Jeremić L, Branković B, Jovanović M, Kostov M, Zdravković M, Milić D. Safety of simultaneous colon and liver resection for colorectal liver metastases. *Vojnosanit Pregl* 2008; **65**: 153-157 [PMID: 18365673 DOI: 10.2298/VSP0802153S]
- 10 **Turrini O**, Viret F, Guiramand J, Lelong B, Bège T, Delperro JR. Strategies for the treatment of synchronous liver metastasis. *Eur J Surg Oncol* 2007; **33**: 735-740 [PMID: 17400418 DOI: 10.1016/j.ejso.2007.02.025]
- 11 **de Haas RJ**, Adam R, Wicherts DA, Azoulay D, Bismuth H, Vibert E, Salloum C, Perdigo F, Benkabbou A, Castaing D. Comparison of simultaneous or delayed liver surgery for limited synchronous colorectal metastases. *Br J Surg* 2010; **97**: 1279-1289 [PMID: 20578183 DOI: 10.1002/bjs.7106]
- 12 **Cheung TT**, Ng KK, Poon RT, Chan SC, Lo CM, Fan ST. A case of laparoscopic hepatectomy for recurrent hepatocellular carcinoma. *World J Gastroenterol* 2010; **16**: 526-530 [PMID: 20101784 DOI: 10.3748/wjg.v16.i4.526]
- 13 **Cheung TT**, Poon RT, Yuen WK, Chok KS, Tsang SH, Yau T, Chan SC, Lo CM. Outcome of laparoscopic versus open hepatectomy for colorectal liver metastases. *ANZ J Surg* 2012 Oct 4; Epub ahead of print [PMID: 23035809 DOI: 10.1111/j.1445-2197.2012.06270.x]
- 14 **Cheung TT**, Poon RT, Yuen WK, Chok KS, Jenkins CR, Chan SC, Fan ST, Lo CM. Long-term survival analysis of pure laparoscopic versus open hepatectomy for hepatocellular carcinoma in patients with cirrhosis: a single-center experience. *Ann Surg* 2013; **257**: 506-511 [PMID: 23299521 DOI: 10.1097/SLA.0b013e31827b947a]
- 15 **Law WL**, Chu KW, Tung HM. Early outcomes of 100 patients with laparoscopic resection for rectal neoplasm. *Surg Endosc* 2004; **18**: 1592-1596 [PMID: 15931488]
- 16 **Bretagnol F**, Hatwell C, Farges O, Alves A, Belghiti J, Panis Y. Benefit of laparoscopy for rectal resection in patients operated simultaneously for synchronous liver metastases: preliminary experience. *Surgery* 2008; **144**: 436-441 [PMID: 18707042 DOI: 10.1016/j.surg.2008.04.014]
- 17 **Hatwell C**, Bretagnol F, Farges O, Belghiti J, Panis Y. Laparoscopic resection of colorectal cancer facilitates simultaneous surgery of synchronous liver metastases. *Colorectal Dis* 2013; **15**: e21-e28 [PMID: 23088162 DOI: 10.1111/codi.12068]
- 18 **Hoekstra LT**, Busch OR, Bemelman WA, van Gulik TM, Tanis PJ. Initial experiences of simultaneous laparoscopic resection of colorectal cancer and liver metastases. *HPB Surg* 2012; **2012**: 893956 [PMID: 23082043 DOI: 10.1155/2012/893956]
- 19 **Nguyen KT**, Laurent A, Dagher I, Geller DA, Steel J, Thomas MT, Marvin M, Ravindra KV, Mejia A, Lainas P, Franco D, Cherqui D, Buell JF, Gamblin TC. Minimally invasive liver resection for metastatic colorectal cancer: a multi-institutional, international report of safety, feasibility, and early outcomes. *Ann Surg* 2009; **250**: 842-848 [PMID: 19806058 DOI: 10.1097/SLA.0b013e3181bc789c]
- 20 **Slessor AA**, Simillis C, Goldin R, Brown G, Mudan S, Tekkis PP. A meta-analysis comparing simultaneous versus delayed resections in patients with synchronous colorectal liver metastases. *Surg Oncol* 2013; **22**: 36-47 [PMID: 23253399 DOI: 10.1016/j.suronc.2012.11.002]
- 21 **Kantorová I**, Lipská L, Bělohávek O, Visokai V, Trubač M, Schneiderová M. Routine (18)F-FDG PET preoperative staging of colorectal cancer: comparison with conventional staging and its impact on treatment decision making. *J Nucl Med* 2003; **44**: 1784-1788 [PMID: 14602860]
- 22 **Papa A**, Rossi L, Lo Russo G, Giordani E, Spinelli GP, Zullo A, Petrozza V, Tomao S. Emerging role of cetuximab in the treatment of colorectal cancer. *Recent Pat Anticancer Drug Discov* 2012; **7**: 233-247 [PMID: 22264223 DOI: 10.2174/157489212799972882]
- 23 **Tsujii M**. Search for novel target molecules for the effective treatment or prevention of colorectal cancer. *Digestion* 2012; **85**: 99-102 [PMID: 22269287 DOI: 10.1159/000334678]
- 24 **Law WL**, Lee YM, Choi HK, Seto CL, Ho JW. Impact of laparoscopic resection for colorectal cancer on operative outcomes and survival. *Ann Surg* 2007; **245**: 1-7 [PMID: 17197957 DOI: 10.1097/01.sla.0000218170.41992.23]
- 25 **van der Pas MH**, Haglind E, Cuesta MA, Fürst A, Lacy AM, Hop WC, Bonjer HJ. Laparoscopic versus open surgery for rectal cancer (COLOR II): short-term outcomes of a randomised, phase 3 trial. *Lancet Oncol* 2013; **14**: 210-218 [PMID: 23395398 DOI: 10.1016/S1470-2045(13)70016-0]
- 26 **Gunka I**, Dostalík J, Martinek L, Gunkova P, Mazur M, Vavra P. Long-term results of laparoscopic versus open sur-

- gery for nonmetastatic colorectal cancer. *Acta Chir Belg* 2012; **112**: 139-147 [PMID: 22571077]
- 27 **Schwenk W**, Haase O, Günther N, Neudecker J. Methodological quality of randomised controlled trials comparing short-term results of laparoscopic and conventional colorectal resection. *Int J Colorectal Dis* 2007; **22**: 1369-1376 [PMID: 17530263 DOI: 10.1007/s00384-007-0318-7]
- 28 **Franks PJ**, Bosanquet N, Thorpe H, Brown JM, Copeland J, Smith AM, Quirke P, Guillou PJ. Short-term costs of conventional vs laparoscopic assisted surgery in patients with colorectal cancer (MRC CLASICC trial). *Br J Cancer* 2006; **95**: 6-12 [PMID: 16755298 DOI: 10.1038/sj.bjc.6603203]
- 29 **Schwenk W**, Böhm B, Haase O, Junghans T, Müller JM. Laparoscopic versus conventional colorectal resection: a prospective randomised study of postoperative ileus and early postoperative feeding. *Langenbecks Arch Surg* 1998; **383**: 49-55 [PMID: 9627171 DOI: 10.1007/s004230050091]
- 30 **Ohtani H**, Tamamori Y, Arimoto Y, Nishiguchi Y, Maeda K, Hirakawa K. A meta-analysis of the short- and long-term results of randomized controlled trials that compared laparoscopy-assisted and open colectomy for colon cancer. *J Cancer* 2012; **3**: 49-57 [PMID: 22315650 DOI: 10.7150/jca.3621]
- 31 **Liang Y**, Li G, Chen P, Yu J. Laparoscopic versus open colorectal resection for cancer: a meta-analysis of results of randomized controlled trials on recurrence. *Eur J Surg Oncol* 2008; **34**: 1217-1224 [PMID: 18155389 DOI: 10.1016/j.ejso.2007.11.004]
- 32 **Nguyen KT**, Marsh JW, Tsung A, Steel JJ, Gamblin TC, Geller DA. Comparative benefits of laparoscopic vs open hepatic resection: a critical appraisal. *Arch Surg* 2011; **146**: 348-356 [PMID: 21079109 DOI: 10.1001/archsurg.2010.248]
- 33 **Cherqui D**, Laurent A, Tayar C, Chang S, Van Nhieu JT, Loriau J, Karoui M, Duvoux C, Dhumeaux D, Fagniez PL. Laparoscopic liver resection for peripheral hepatocellular carcinoma in patients with chronic liver disease: midterm results and perspectives. *Ann Surg* 2006; **243**: 499-506 [PMID: 16552201 DOI: 10.1097/01.sla.0000206017.29651.99]
- 34 **Gayet B**, Cavaliere D, Vibert E, Perniceni T, Levard H, Denet C, Christidis C, Blain A, Mal F. Totally laparoscopic right hepatectomy. *Am J Surg* 2007; **194**: 685-689 [PMID: 17936436 DOI: 10.1016/j.amjsurg.2006.11.044]
- 35 **Gumbs AA**, Gayet B. Totally laparoscopic central hepatectomy. *J Gastrointest Surg* 2008; **12**: 1153 [PMID: 17952517 DOI: 10.1007/s11605-007-0353-2]

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