ORIGINAL ARTICLE

Incisional hernia after open resections for colorectal liver metastases – incidence and risk factors

Jan H. Nilsson[1], Peter Strandberg Holka[1] & Christian Sturesson[1]

[1]Department of Surgery, Clinical Sciences Lund, Lund University and Skåne University Hospital, Lund, Sweden

Abstract

Background: Incisional hernia is one of the most common complications after laparotomy. The aim of this retrospective study was to investigate incidence, location and risk factors for incisional hernia after open resection for colorectal liver metastases including the use of perioperative chemotherapy and targeted therapy evaluated by computed tomography.

Methods: Patients operated for colorectal liver metastases between 2010 and 2013 were included. Incisional hernia was defined as a discontinuity in the abdominal fascia observed on computed tomography.

Results: A total of 256 patients were analyzed in regard to incisional hernia. Seventy-eight patients (30.5%) developed incisional hernia. Hernia locations were midline alone in 66 patients (84.6%) and involving the midline in another 8 patients (10.3%). In multivariate analysis, preoperative chemotherapy >6 cycles (hazard ratio 2.12, 95% confidence interval 1.14–3.94), preoperative bevacizumab (hazard ratio 3.63, 95% confidence interval 1.86–7.08) and incisional hernia from previous surgery (hazard ratio 3.50, 95% confidence interval 1.98–6.18) were found to be independent risk factors.

Conclusions: Prolonged preoperative chemotherapy and also preoperative bevacizumab were strong predictors for developing an incisional hernia. After an extended right subcostal incision, the hernia location was almost exclusively in the midline.

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Correspondence

Department of Surgery, Skåne University Hospital, S-221 85 Lund, Sweden. Tel: +46 46 172347. Fax: +46 46 172335. E-mail: christian.sturesson@med.lu.se

Introduction

Incisional hernia is one of the most common complications after laparotomy. The reported incidence is highly variable depending on underlying disease, type of incision used, length of follow up and method for hernia detection.[1] Numerous risk factors associated with an increased incisional hernia incidence have been reported, including gender (both male and female), age, surgical site infection, obesity and aortic aneurysm.[1–4] The incisional hernia incidence after liver resections has been studied only to a limited extent[2,5,6]. No study including only patients with liver metastases from colorectal cancer has previously been made.

Liver metastases are a common consequence of colorectal cancer where the only available potential curative treatment is surgery.[7,8] Although laparoscopic liver resections are feasible and increasingly being used, open resection is still the most common procedure.[9] Before liver resection of colorectal metastases a majority of patients receive preoperative chemotherapy[9,10] which has been shown to be an independent risk factor for incisional hernia.[11] Non-midline incisions give lesser incisional hernias and in liver resections an extended right subcostal incision is recommended.[1,2]

Medical imaging diagnostics increases the ability to detect incisional hernias as compared to physical examination.[1,4,12] Computed tomography (CT) has been suggested as the "gold standard" because of its high reliability for diagnosing incisional hernia.[4] Still, few studies exist that have used CT in a consequent manner to analyze incisional hernia incidence.

The aim of this retrospective study was to investigate incidence, location and risk factors for incisional hernia after open liver resection for colorectal liver metastases including the use of perioperative chemotherapy and targeted therapy evaluated by CT.

Table 1 Patient characteristics for the two groups with and without incisional hernia

	Incisional hernia	No incisional hernia	*P*
Number of patients	78	178	–
Gender (male:female)	48:30	110:68	0.969
Age (years)	68 (37–82)	68 (35–85)	0.880
Current smoking	13	36	0.505
Diabetes mellitus	11	19	0.432
Body mass index (kg/m^2)	26.0 (18.4–41.1)	25.0 (17.7–38.2)	0.076
Total muscle area (mm^2)	13,360 (6391–20,599)	13,350 (5460–21,906)	0.802
Skeletal muscle depletion	27	76	0.225
Subcutaneous fat (mm)	12 (3–34)	12 (2–35)	0.415
Body fat percentage (%)	39.1 (19.2–57.2)	38.0 (8.6–66.6)	0.531
Preoperative chemotherapy	44	96	0.656
Number of chemotherapy cycles	5 (1–16)	5 (1–13)	0.552
Preoperative chemotherapy > 6 cycles	13	19	0.169
Preoperative bevacizumab	11	8	0.009
Previous liver resection	15	18	0.045
Incisional hernia before surgery	23	13	<0.0001
ASA grade (1/2:3/4)	54:24	129:49	0.597
Preoperative albumin (g/l)	38 (25–46)	38 (24–47)	0.522
Preoperative creatinine (μmol/l)	73.5 (36–132)	73.0 (31–150)	0.645
Operating time (hours)	4.76 (1.0–9.8)	4.75 (1.1–13.0)	0.955
Operative bleeding (ml)	350 (25–2000)	300 (25–8000)	0.683
Incision type (ERSI:Mercedes)	60:16	138:36	0.948
Major resection	26	68	0.457
Hospital stay (days)	7 (3–34)	7 (2–76)	0.804
Incisional surgical site infection	8	15	0.638
Remote infection	3	9	0.673
Morbidity (Clavien-Dindo ≥ 3)	9	18	0.732
Postoperative chemotherapy	45	104	0.774

Data are presented as number or median (range). ASA, American Society of Anesthesiologists; ERSI, extended right subcostal incision.

Patients and methods

Patients operated for colorectal liver metastases by laparotomy were included. Data were obtained retrospectively from patient records and radiological imaging examinations. Extracted data consisted of age, gender, length, weight, body mass index, current smoking, diabetes mellitus, preoperative chemotherapy (defined as chemotherapy administration within 90 days before surgery), preoperative blood samples, American Society of Anesthesiologists (ASA) grade, operative procedure, 30-day morbidity classified according to Clavien-Dindo[13] and postoperative chemotherapy (defined as chemotherapy administration within 90 days after surgery). Prolonged preoperative chemotherapy was defined as more than 6 cycles.

The most recent preoperative CT scan and all CT images from the normal patient follow-up program, typically consisting of one CT scan every six month the first three years followed by one CT scan yearly, were analyzed by one investigator (JHN). Incisional hernia was defined as a discontinuity in the abdominal fascia observed on CT scan.[3,11] On preoperative CT, the existence of an incisional hernia from previous colorectal resection or previous liver resection was recorded. The localization of incisional hernia after liver operation was determined to midline, mid-subcostal or lateral, where the midline was unaffected by the hernia in the latter two groups. Subcutaneous fat thickness was measured 2 cm caudal from the xiphoid process on preoperative CT images. Total preoperative muscle area (TMA) was manually traced on the CT transversal plane image on the third lumbar level where vertebral spinae were clearly visible and then automatically calculated.[14,15] From TMA, a skeletal muscle index (SMI) was calculated by correcting for height. Skeletal muscle depletion, previously often referred to as sarcopenia, was defined as SMI <41.1 cm^2/m^2 for women and <43.75 cm^2/m^2 for men.[15,16] Body fat percentage was calculated as body weight (kg) – (0.3 × TMA (cm^2))/body weight (kg).[17,18]

If a liver re-resection was made on a patient the incisional hernia incidence follow-up was ceased and the patient was analyzed as a new patient with a new incisional hernia follow-up.

The study protocol was approved by the regional ethics committee.