

The majority of surgical departments adhere to national Danish guidelines for surveillance after colorectal cancer surgery

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ABSTRACT

INTRODUCTION: In 2003 the use of post-operative surveillance (POS) after surgery for colorectal cancer (CRC) in Denmark was studied. Diversity in the choice and frequency of surveillance modalities was found. Subsequently, the Danish Colorectal Cancer Group (DCCG) has published guidelines for POS. In the same period, the number of departments performing CRC surgery has been reduced by 50% nationally.

The aim of the present study was to describe the POS after CRC in Denmark following a reduction in the number of departments performing s for CRC and the DCCG's publication of national recommendations for POS programmes.

MATERIAL AND METHODS: Questionnaires were sent to all 19 departments that performed operations for CRC. Questions concerned the diagnostic modalities used for detecting recurrences and metachrone cancers.

RESULTS: All departments returned their questionnaires. All departments had a formal POS programme. The recommendations given by the DCCG were met by 17 departments (89%) with regard to liver metastases, by 16 departments (84%) with regard to lung metastases and by 16 departments (84%) with regard to metachrone cancers.

CONCLUSION: As opposed to what was observed in 2003, all departments offered a POS programme after CRC surgery in 2012. Almost all departments met the DCCG recommendations, probably owing to the centralization of CRC surgery and the DCCG's introduction of national guidelines. Hopefully, this will contribute to a better survival for CRC patients in the future, although more research is needed to establish optimal post-operative surveillance.

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In Denmark approximately 4,000 patients are diagnosed with colorectal cancer (CRC) annually. In about 2,400 of these patients, a resection with a curative intent is performed [1].

After intended curative treatment of CRC, post-operative surveillance (POS) is carried out for the following reasons [2]: Early diagnosis of local and distant recurrence, early diagnosis of metachrone cancers, cancer prevention by removal of adenomas, psychosocial sup-

port, evaluation of current treatment modalities and evaluation of new therapies.

About 40% of all curatively resected CRC patients will develop recurrence, and approximately 80% of these recurrences will occur within three years after the primary resection with liver and lungs as the predominant localizations of relapse [3, 4].

In 2003 the pattern of POS after intended curative CRC operations in Denmark was evaluated with regard to diagnosis of local and distant recurrence and diagnosis of metachrone cancers [5]. At that time, patients with CRC were operated at a total of 38 departments. In all, 28 of these departments (74%) offered their patients a POS programme. Diversity in the choice of surveillance modalities as well as in the frequency of the use of these modalities was observed.

CRC treatment has been centralized in Denmark since 2003. At present (2012), 15 departments perform operations for both colon and rectal cancer and four departments perform operations for colon cancer only.

Some of the departments in Denmark participate in the international COLOFOL study which compares high-intensity POS with low-intensity POS after CRC surgery with the following endpoints: total mortality, cancer-specific mortality after five years, as well as recurrence-free survival [6]. The study is currently ongoing.

As a minimum intervention, the Danish Colorectal Cancer Group (DCCG) recommends a POS programme which includes a multi-slice computed tomography (CT) of the liver and the lungs 12 and 36 months post-operatively [2], and a colonoscopy every five years until the age of 75 year to detect metachrone cancers [2].

The aim of the present study was to describe the POS for CRC with regard to the diagnosis of local and distant recurrences and diagnosis of metachrone cancers after the reduction in the number of departments performing CRC surgery and the DCCG's publication of national guidelines for POS programmes

MATERIAL AND METHODS

A questionnaire study was performed including all 19 departments which performed CRC surgery in Denmark according to the latest annual DCCG report from 2011

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[1]. The departments were asked if their patients were offered to participate in a POS programme after curative resection of CRC. If so, they were asked about the modalities used, the frequency of these modalities and the length of the control period.

The departments were also asked if they participated in the COLOFOL protocol.

All data were anonymously included in the study.

Trial registration: not relevant.

RESULTS

All 19 departments returned the questionnaires. Three departments were contacted twice before returning the questionnaire.

Five departments (26%) had a POS programme similar to the minimum recommendations established by the DCCG, while fourteen departments (74%) had established local programmes. Eight departments (42%) participated in the COLOFOL protocol. Some of these eight departments had POS programmes different from the COLOFOL protocol for those of their patients who did not participate in the COLOFOL protocol.

A comparison between the pattern of POS in 2003 and 2012 is shown in **Table 1**.

Clinical out-patient control

Three departments (16%) had no regular clinical out-patient control in place post-operatively, but used only imaging and/or tumour marker controls with postal answers to the patients.

The remaining 16 departments (84%) had established clinical out-patient control at different intervals

for a period of 24-60 months post-operatively. Six of the 15 departments (40%) performing rectal cancer surgery had a higher rate of clinical out-patient controls in their POS programmes after rectal cancer than in their POS programmes after colon cancer.

Tumour markers

Eleven departments (58%) used carcinoembryonal antigen (CEA) in their POS programmes. Seven departments (37%) used CEA on a regular basis post-operatively, while one department (5%) measured CEA post-operatively in selected cases, and three departments (16%) measured CEA post-operatively if the preoperative value was increased.

Computed tomography and positron emission tomography-computed tomography

Seventeen departments (89%) used CT and one (5%) positron emission tomography CT (PET-CT) of the thorax and abdomen in their POS programmes. The PET-CT or CT examinations were performed at intervals of 6-24 months for a period of 24-60 months. The total number of PET-CT or CT performed in the POS programme period ranged 1-6. The department that did not use CT/PET-CT, used X-ray of the thorax and ultrasound of the abdomen instead.

X-ray of the chest

Two departments used X-ray of the chest (11%): One of these departments alternated between CT and X-ray of the chest every six months. The other department used X-ray as the only imaging modality of the thorax together with US of the abdomen at 12 and 24 months post-operatively.

Ultrasound of the liver

Four departments (21%) used US of the liver at intervals ranging 3-24 months. Two of these departments (11%) used contrast-enhanced US. Three of the departments (16%) used US of the liver alternating with CT of the abdomen.

Control for local recurrence in rectal cancer

None of the 15 departments performing rectal cancer surgery used MRI or transrectal ultrasound (TRUS) on a regular basis in their POS programmes after rectal cancer surgery.

Eleven departments (73%) used rigid or flexible sigmoidoscopy in their POS programmes after rectal cancer at intervals ranging 3-12 months. The total number of rigid or flexible sigmoidoscopy ranged 1-8 in the 24-60-month POS period. Four departments (27%) had no regular control for endoluminal recurrence after rectal cancer.

TABLE 1

Post-operative surveillance in 2003 and 2012.

	2003	2012
Departments performing colon cancer surgery, n/N	37/38	19/19
Departments performing rectal cancer surgery, n/N	27/38	14/19
Clinical out-patient control, n/N (%)	24/38 (63)	16/19 (84)
Use of CEA in POS programmes, n/N (%)	9/38 (24)	11/19 (58)
CT thorax, n/N (%)	10/38 (26)	18/19 (95)
CT/US abdomen, n/N (%)	14/38 (37)	19/19 (100)
Frequency of post-operative colonoscopies, months	24-60	24-60
"Clean colon" colonoscopy, n/N (%)	38/38 (100)	19/19 (100)
Additional colonoscopy until the age of 75 years, n/N (%)	21/39 (55) ^a	16/19 (84)
Regular endoluminal control after rectal cancer, n/N (%)	17/27 (63)	10/14 (71)
Meets the DCCG's POS recommendations concerning the liver, n/N (%)	–	16/19 (84)
Meets the DCCG's POS recommendations concerning the chest, n/N (%)	–	16/19 (84)
Meets the DCCG POS recommendations concerning metachrone tumours, n/N (%)	–	16/19 (84)

CEA = carcinoembryonal antigen; CT = computed tomography; DCCG = Danish Colorectal Cancer Group; POS = post-operative surveillance; US = ultrasound.

a) Control until 70-80 years.

Surveillance for metachrone cancers

All 19 departments in our study had included colonoscopy in their POS programmes. All departments (100%) performed a perioperative colonoscopy to secure a clean colon and offered an additional colonoscopy 24–60 months post-operatively. Sixteen departments (86%) offered regular additional colonoscopies until the age of 75 years, and one department (5%) until the age of 70 years. The remaining two departments (10%) did not offer additional colonoscopies on a regular basis.

DISCUSSION

Since the last evaluation of Danish POS programmes from 2003 published in 2005 [5], the total number of departments performing CRC cancer surgery has been reduced by 50% from 38 to 19. In 2003, a total of 27 departments performed rectal cancer surgery compared with 15 departments in 2012. In 2003, a total of 28 of the 38 CRC departments (74%) offered a POS programme on a regular basis to their patients. Today, all 19 departments (100%) offer their patients a regular POS programme after CRC surgery with a curative intent.

Several studies have indicated that CEA is useful in detecting liver metastases and that the sensitivity is > 80% [7]; and a meta-analysis from 2003 indicated a survival benefit in surveillance programmes using CEA [8]. However, CEA seems of minimal value in identifying pulmonary metastasis in rectal cancer [9]. In 2003, nine of 34 departments (26%) used CEA regularly. In 2012, the use of CEA had increased as 11 of 19 departments (58%) were using CEA in their POS programmes.

The liver is the most common site of metastases in CRC. 15–20% of the patients will have liver metastases at the time of diagnosis, and a further 15–20% will develop liver metastases within three years after intended curative resection for CRC [10–12]. Diagnostic imaging of the liver as a part of a POS programme therefore seems highly relevant. For the detection of liver metastases, CT is superior to ordinary US [13] while contrast enhanced US is better than ordinary US [14] and seems equal to CT [15]. Contrast-enhanced MRI seems superior to all other diagnostic imaging in the detection liver metastases [16].

In 2003, only 14 of the 38 departments (37%) performing CRC surgery used abdominal CT or US on a regular basis in their POS programmes. In the present study, all 19 CRC departments (100%) were using an imaging modality to detect liver metastases in their POS programmes. CT or PET-CT were used in 18 departments (95%). Three departments (16%) used US as a supplement to CT to detect liver metastasis and one department used US as the single imaging modality of the liver.

Sixteen departments (84%) performed two CT ex-



CT formed part of the post-operative surveillance programmes in almost all departments performing colorectal cancer surgery in 2012.

aminations of the liver within the first three years post-operatively as a minimum, as recommended by the DCCG. One of the remaining three departments had a 24-month POS programme that included two CTs (at 12 and 24 months post-operatively), the other department performed one CT within the first 36 months years together with five contrast-enhanced US of the liver, and the third department had a POS programme that included examination of the liver with US only (12 and 24 months post-operatively).

10–22% of CRC patients will develop pulmonary metastases [4]. But since many previous reports have relied on chest radiographs or low-resolution CT, it is possible that pulmonary metastases have been under-diagnosed. Some studies have indicated that pulmonary metastases are more common in rectal cancer than in colon cancer, and it has thus been found that the incidence of isolated pulmonary metastases is twice as common in patients with rectal cancer as in patients with colon cancer [9, 10].

In contrast to X-ray, CT is capable of identifying small-volume disease in the chest. However, PET-CT is superior to CT in detecting pulmonary metastases and has a high sensitivity and specificity in detecting small pulmonary metastases with a limit in size of 7 mm [17].

In 2003, ten of 38 departments (26%) used chest CT or X-ray with a frequency of once every 6–12 month for a period of 12–60 months. All 19 departments (100%) in the present 2012 study examined for pulmonary metastases. CT or PET-CT was used in 18 departments (95%) to detect pulmonary metastasis. One of these departments alternated between CT and X-ray of the chest every six months. The last department used X-ray after 12 and 24 months as the only imaging modality of the chest in its POS programme. The number of examinations to detect pulmonary metastases varied 1–10 in the POS period. DCCG recommends a minimum of two CTs of the chest within the first three years [2]. Sixteen departments (84%) met the minimum recommendations

given by DCCG according to CT of the chest. One of the remaining three departments offered a single CT scan of the chest within the first three years post-operatively, one department had a two-year POS programme that included two CTs of the chest and one department had a POS programme that included X-ray of the chest after 12 and 24 months.

The risk for metachrone cancer ranges between 2% and 10% for a patient with a first-time CRC diagnosis [18]. The risk depends on the age of the patient at the onset of first-time cancer as well as the length of the observation period. In patients younger than 40 years of age at diagnosis of the primary cancer, the cumulative incidence rate of metachrone colorectal cancer has been shown to be 30% [19]. A minor survival effect of post-operatively colonoscopy in the POS programmes has been found [20].

In 2003, all departments (100%) did a perioperative colonoscopy for synchronous cancer. At least one additional post-operative colonoscopy was offered at 35 of the departments (92%), and 21 departments (55%) offered several additional colonoscopies until the age of 70-80 years. In the present study, all departments (100%) offered peri- as well as post-operative colonoscopies. Sixteen departments (84%) offered additional colonoscopies at a 24-60 month interval until the age of 75-80 years. One department (5%) offered additional colonoscopies with an interval of at least five years until the year of 70, and two departments (11%) did not offer additional colonoscopies.

In rectal cancer, the introduction of total mesorectal excision and chemo-radiotherapy has dramatically reduced the rate of local recurrence to less than 10%. In 2003, 17 of the departments (63%) performing operations for rectal cancer did endoluminal control for recurrence with a frequency of once every 3-6 month in a 3-60-month period. In the present study, ten out of 15 departments (67%) performing operations for rectal cancer did endoluminal control for recurrences once every 3-12 months for a period of 24-60 months.

CONCLUSION

In 2003, a total of 26% of the departments performing CRC surgery offered no POS programme to their patients; and among the remaining departments, diversity in the choice of surveillance modality and in the frequency of the use of these modalities was observed. Ten years later, in 2012, all departments offered a formal POS programme after CRC surgery with a curative intent. As in 2003, diversity in the choice of surveillance modality and in the frequency of the use of these modalities was observed, but almost all departments met the national minimum recommendations, probably owing to centralization of CRC surgery as well as national

guidelines published by the Danish Colorectal Cancer Group. Hopefully, this will contribute to a better survival for CRC patients in the future, although more research is needed to establish optimal post-operative surveillance.

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