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ARTICLE

Ovarian cancer: what's new, where next?

John A Spencer

Leeds Cancer Centre, St James's University Hospital, Leeds, UK

Corresponding address: John A Spencer, Leeds Cancer Centre, St James's University Hospital, Leeds, UK.
E-mail: johnaspencer50@hotmail.com

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Abstract

The recent RDOG studies have confirmed the value of CT in the management of ovarian cancer. However we now know that metastases to the ovary may exactly mimic primary cancer. This demands a firm histological diagnosis when surgery is not planned and especially with a history of breast and gastrointestinal tract cancer. CT guided needle biopsy can provide this.

Keywords: *Ovary; neoplasms; peritoneum; biopsy; CT; MR.*

In the last few years a number of important studies relating to the investigation and management of ovarian cancer have firmly established a pivotal role in management for CT[1–4]. CT provides accurate staging information, identifying key sites of disease which influence the success of cytoreductive surgery (Fig. 1). CT facilitates histological diagnosis from needle core biopsy when surgery is considered inappropriate[4]. These studies have provided a strong evidence base for current practice but we are left with some uncertainties. We now know that disease metastatic to the ovaries can be indistinguishable from primary ovarian cancer[3] and this demands a histological diagnosis when definitive surgery is not possible rather than relying upon a cytological diagnosis of adenocarcinoma. The Radiology Diagnostic Oncology Group (RDOG) studies did not address the question of imaging in assessment of treatment response and in the management of treated cancer. The majority of women with ovarian cancer have disseminated disease at presentation and will experience one or several relapses before death. This workload far exceeds that of imaging at initial diagnosis and staging.

CT has become the mainstay of imaging during treatment and in assessment of suspected relapse. This allows objectivity and reproducibility in follow-up and is a pragmatic approach based upon directives from pharmaceutical companies or their agents conducting clinical trials, latterly contained within the RECIST (response to treatment in solid tumours) guidelines[5]. The use of second look laparotomy to identify residual disease after primary chemotherapy has declined and now clinical, CT and tumour marker assessments are used to confirm remission. The National Cancer Institute (NCI) in the United States has advised no routine imaging follow-up for treated women.

Within the Leeds Cancer Centre in the multidisciplinary team for ovarian cancer we have addressed a number of issues relating to monitoring of treatment response, follow-up and assessment of suspected relapse by means of audit and original research. The findings underpin our own guidelines and practice.

There is no support for routine imaging in the follow-up of treated ovarian cancer. As part of the ICON3 Medical Research Council (MRC) study women with treated ovarian cancer in complete remission or with stable disease residue were randomised to receive placebo or interferon therapy to evaluate whether the latter influenced the rate of relapse. It did not. This cohort of women had regular CT, clinical and CA125 assessment and these data have been analysed to identify the incremental impact of CT[6]. Our findings are as follows:

(1) Clinical evaluation was poor in detection of relapse.

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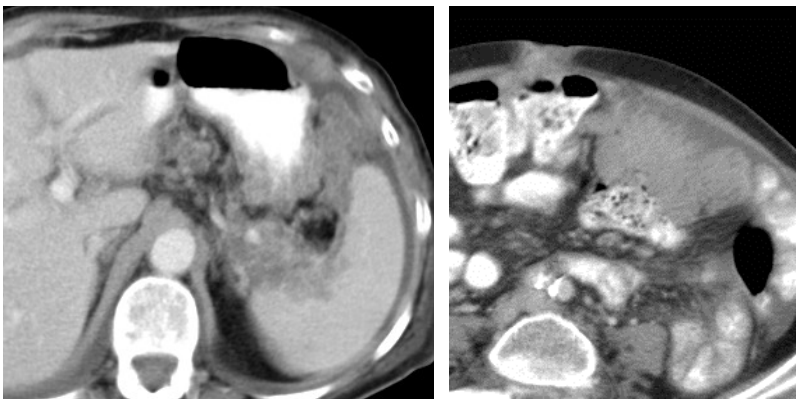


Supracolic, splenic Infracolic, umbilical

Figure 1 **Stage IIIC ovarian cancer with bulky omental cake. The infracolic disease is resectable but the supracolic disease also involving the spleen is not and thus needle biopsy and primary chemotherapy should be considered.**

(2) CA125 was able to detect the majority of relapses but CT was required to identify its extent and to define treatment options.

(3) About one in 10 women with advanced ovarian cancer did not have elevated CA125 levels and for this subgroup CT was essential to identify relapse.

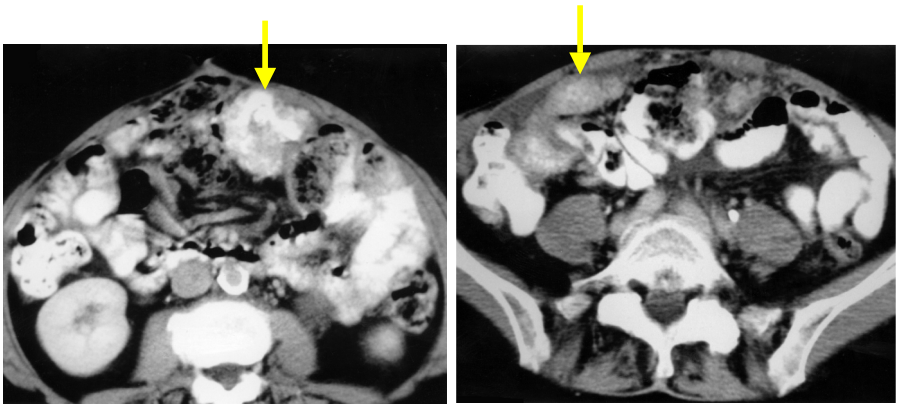
Thus, our findings support expert guidance from the NCI excepting the minority of CA125 negative women for whom CT may be useful. In the MRC study we used CT at 6-month intervals or at suspected relapse and so this scan protocol is recommended.

What should be done after a negative CT performed to investigate an elevated CA125 and/or a clinically suspected relapse? CT has some limitations. Vaginal vault relapse may be underdiagnosed and this requires expert clinical assessment. Small volume peritoneal disease may not be detected although recent studies of multislice CT suggest detection of deposits into the subcentimetre range[7]. Alternative strategies include a wait and watch policy with interval re-examination by CT, examination by more sophisticated techniques such as gadolinium enhanced fat suppressed abdomino-pelvic MR imaging or PET[8,9], surgical exploration or laparoscopy or even rechallenge chemotherapy when there is compelling clinico-biochemical evidence. Recently the role of chest CT in finding relapse above the diaphragm has been investigated.

In two retrospective studies of the value of CT in follow-up it was concluded that there was limited value for chest CT and that supradiaphragmatic relapse in the absence of abdomino-pelvic disease was rare[10,11]. There was 'chest only' relapse in 3–4% of women in these studies. The commonest chest manifestation was pleural effusion seen in up to 40% of women at some point in their history[10]. Lung metastases were seen in 6% of women at some point but all had prior abdomino-pelvic disease[11]. These authors suggested a role for chest CT when abdomino-pelvic CT had failed to explain a tumour marker rise. Lung metastasis and lymphangitis are rare; mediastinal lymphadenopathy is not uncommon. We have seen several women in whom calcified nodal disease from papillary serous tumours has been dismissed as old tuberculous disease[12]. It is important to check whether the patient is old enough to have encountered tuberculosis, and that the nodes are not enlarging! Pleural and neck disease does occur with ovarian cancer and may even be its presenting feature. In our practice we rely upon clinical examination and chest radiography to assess these areas at diagnosis. If there is pleural disease the chest is included in the CT. Once the effusion has resolved we rely upon surveillance of the lung base on the abdominal CT in follow-up.

Another consideration is the number of scans that are required in assessment of treatment response. If a skilled operator says that there is no residual disease after cytoreductive surgery for histologically proven disseminated ovarian cancer then why not just give the chemotherapy, monitor the response with CA125 and obtain a new baseline CT after chemotherapy against which to compare a CT at suspected relapse. Conversely, some clinical trials demand CT before chemotherapy, after cycles 2, 4 and 6 and then after a further 4 weeks to confirm remission. Our audit has shown that women can be stratified according to risk and monitored according to this with CT. Thus, if the tumour is believed to be completely debulked we only perform CT as a new baseline before chemotherapy—occasionally upper abdominal residue is underscored surgically—and after chemotherapy as a new baseline. Women with residual tumour also have CT after cycle 3 or at suspected progression.

A variety of unexpected masses may be identified by CT on the baseline post-surgical CT and it can be difficult to distinguish between treatment complications and residual tumour. Further analysis of the MRC ICON3



Calcifying papillary serous carcinoma

Figure 2 **Two cases of stage IIIC ovarian cancer with calcified omental cakes (arrows) which mimic large and small bowel.**

data has shown substantial overlap in appearance between haematoma, abscess and lymphocele and between these and tumour[13]. There may be marked thickening at the vaginal vault and fluid collections may be seen here as well as a variety of other pelvic locations. Haematoma of the round ligament may mimic cystic tumour on the pelvic sidewall. Ovarian vein thrombosis may also occur with the great majority of cases on the right. Characteristic CT findings are of a tubular retroperitoneal mass along the course of the vein from the pelvis to the infrarenal vena cava[14].

Finally, it is important to remember that CT findings with recurrent ovarian cancer may differ from those at initial diagnosis. In the post-surgical patient there is no greater omentum and so omental cakes are rarely seen. Recurrent tumour may involve other peritoneal recesses and reflections notably in the supracolic compartment around the spleen and stomach. Unopacified bowel loops may mimic recurrent peritoneal tumour. A meticulous CT technique with thinner sections, decubitus and optimal bowel contrast opacification increases the detection of recurrent disease. Adhesions from previous surgery, radiotherapy or tumour may impair bowel opacification and it can be useful to compare with previous CT studies to identify fixed loops of bowel. Calcified deposits may be mistaken for bowel (Fig. 2). Pelvic recurrence of ovarian cancer may be central at the vaginal vault associated with vaginal bleeding and discharge or lateral involving the pelvic sidewall with venous thrombosis or ureteric obstruction. Ascites may become loculated with displacement of adjacent organs; encysted lesser sac ascites may compress the stomach leading to the squashed stomach syndrome[15].

References

[1] Kurtz AB, Tsimikas JV, Tempany CM *et al*. Diagnosis and staging of ovarian cancer: comparative values of Doppler and conventional US, CT, and MR imaging correlated with surgery and histopathologic analysis—report of the Radiology Diagnostic Oncology Group. Radiology 1999; 212: 19–27.

[2] Tempany CMC, Zou KH, Silverman SG *et al*. Staging of advanced ovarian cancer: comparison of imaging modalities—report from the Radiological Diagnostic Oncology Group. Radiology 2000; 215: 761–7.

[3] Brown DL, Zou KH, Tempany CM *et al*. Primary versus secondary ovarian malignancy: imaging findings of adnexal masses in the Radiology Diagnostic Oncology Group Study. Radiology 2001; 219: 213–18.

[4] Spencer JA, Swift SE, Wilkinson N *et al*. Peritoneal carcinomatosis: image guided peritoneal core-biopsy for tumor type and patient management. Radiology 2001; 221: 173–7.

[5] Therasse P, Arbuck SG, Eisenhauer EA *et al*. New guidelines to evaluate the response to treatment in solid tumours. J Natl Cancer Inst 2000; 92: 205–16.

[6] Clarkson LM, Hennig IM, Sanderson A, Hall GD, Perren TJ, Spencer JA. Is there a role for follow-up CT in the management of ovarian cancer. Radiology 2002; 225(P): 598.

[7] Coakley FV, Choi PH, Gougoutas CA *et al*. Peritoneal metastases: detection with spiral CT in patients with ovarian cancer. Radiology 2002; 223: 495–9.

[8] Low RN, Saleh F, Song SY *et al*. Treated ovarian cancer: comparison of MR imaging with serum CA-125 level and physical examination—a longitudinal study. Radiology 1999; 211: 519–28.

[9] Cho SM, Ha HK, Byun JY *et al*. Usefulness of FDG PET for assessment of early recurrent epithelial ovarian cancer. Am J Roentgenol 2002; 179: 391–5.

[10] Dachman AH, Visweswaran A, Battula R, Jameel S, Waggoner SE. Role of chest CT in the follow-up of ovarian adenocarcinoma. Am J Roentgenol 2001; 176: 701–5.

[11] Sella T, Rosenbaum E, Edelmann DZ, Agid R, Bloom AI, Libson E. Value of chest CT scans in routine ovarian carcinoma follow-up. Am J Roentgenol 2001; 177: 857–9.

[12] Patel SV, Spencer JA, Wilkinson N, Perren TJ. Supradiaphragmatic manifestations of papillary serous adenocarcinoma of the ovary. Clin Radiol 1999; 54: 748–54.

[13] Savader SJ, Otero RR, Savader BL. Puerperal ovarian vein thrombosis: evaluation with CT, US, and MR imaging. Radiology 1988; 167: 637–9.

[14] Sanderson A, Clarkson LM, Hennig IM, Hall GD, Perren TJ, Spencer JA. CT patterns of pelvic relapse in women with treated ovarian cancer. Radiology 2002; 225(P): 686.

[15] Spencer JA, Crosse BA, Mannion RA, Sen KK, Perren TJ, Chapman AH. Gastroduodenal obstruction from ovarian cancer: imaging features and clinical outcome. Clin Radiol 2000; 55: 264–72.