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Incidental pelvic lesions in the oncology patient

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Abstract

The identification of an incidental (i.e. unexpected and asymptomatic) lesion can create a dilemma for the clinician and radiologist. The incidental abnormality may represent metastatic disease, a second primary malignancy or a benign lesion. The diagnosis and management of such incidental findings will depend in part on the clinical setting, the pathology and stage of underlying primary malignancy and the imaging features of the incidental abnormality. This article reviews the diagnosis and management of incidental pelvic lesions in the oncology patient.

Keywords: *Computed tomography; magnetic resonance imaging; positron emission tomography; cancer; imaging.*

Introduction

The growing use of cross-sectional imaging has led to increasing detection of incidental lesions, in both oncology and non-oncology patients, which previously remained undiscovered. These incidental lesions are unexpected and usually asymptomatic abnormalities that are discovered while searching for other pathology. These incidental lesions create a diagnostic and management challenge for clinicians and radiologists. They may result in subjecting patients to unnecessary further investigations and treatment, which carries its own risks and expense. Management strategies in such scenario are emerging and the recognition of this increasing clinical problem has led the American College of Radiologists to develop guidelines and recommendations for incidentally detected lesions on abdominal imaging[1]. The guidance developed addresses incidental finding in the kidney, liver, adrenal glands and pancreas but does not cover pelvic lesions or deal specifically with cancer patients. This article reviews the diagnosis and management of incidentally identified pelvic lesions in oncology patients.

Diagnosis and management

An incidental finding, also known as an incidentaloma, may be defined as an incidentally discovered mass or lesion detected by computed tomography (CT), magnetic resonance imaging (MRI) or other imaging modality performed for an unrelated reason[1,2]. That is, the imaging findings are unrelated to the primary objective of the examination and are therefore unexpected and often asymptomatic.

In the non-cancer patient it is easy to label lesions as incidental, e.g. at CT colonography, which focuses on detecting colorectal polyps, any lesion outside the colon would be considered incidental. The CT of the abdomen and pelvis, performed at CT colonography, has been reported to contain clinically significant incidental findings in 5–16% of asymptomatic patients with higher frequency in symptomatic patients[1]. A recent systematic review of 44 series showed a mean rate of incidental findings of 23.6% and most patients went on to have further follow-up or investigations[3]. There is a wide variation in the rates of reported abnormalities depending on the clinical significance of the lesion with higher rates for minor lesions and lower rates in studies reporting major incidental lesions[3].

However, the definition of an incidental finding or what constitutes an incidentaloma in a cancer patient is much less clear cut. In a cancer patient, many unexpected lesions may potentially be related to the underlying malignancy. Therefore, any abnormality identified has to be evaluated to determine whether it is related to the underlying malignancy or is an unrelated finding. More precisely, an incidentally detected lesion in a cancer patient may represent either: (1) metastatic disease from the known primary or pre-existing malignancy, (2) a second primary malignancy, or (3) a benign lesion. Determining which of these possibilities and thus the management of

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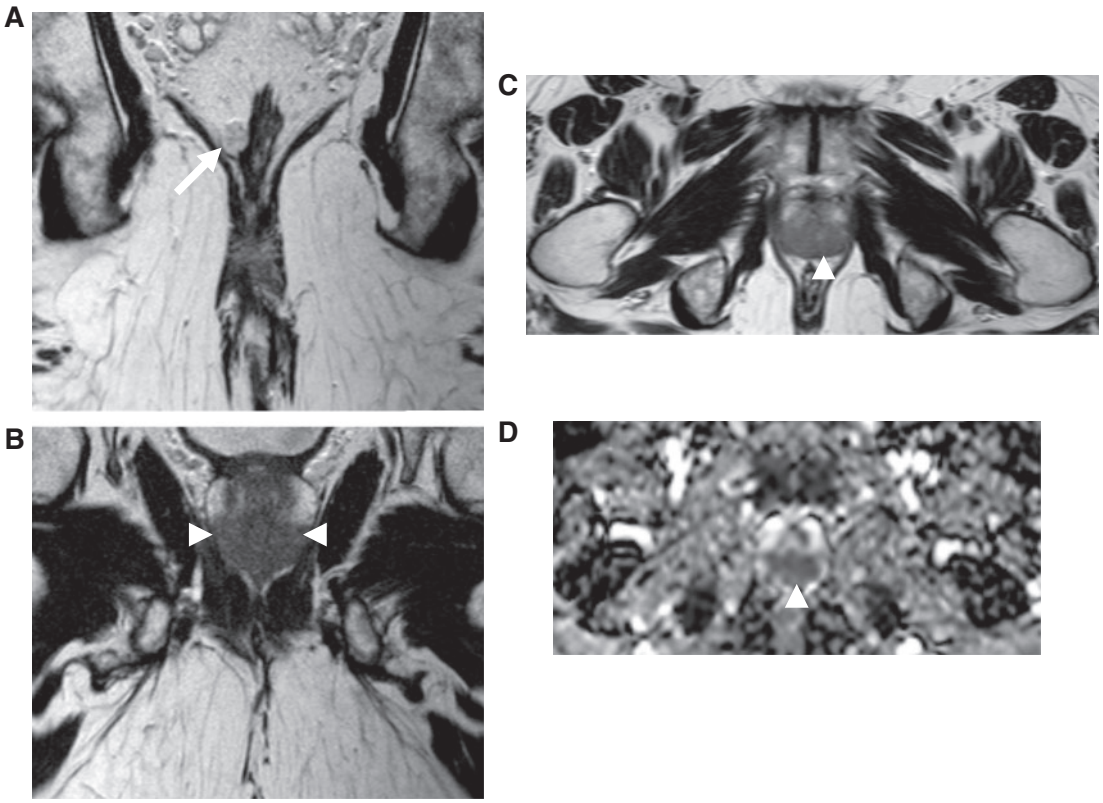

Figure 1 **Incidental prostate cancer. A 62-year-old man was under surveillance following trans-anal endoscopic microsurgery (TEMS) for rectal polyps that had shown carcinoma in situ. A follow-up MRI was performed. The high-resolution coronal oblique T2-weighted images through the (a) rectum and (b) prostate and large field of view (c) T2-weighted images and (d) ADC maps through the pelvis show extra-mural recurrence (arrow) at the site of the TEMS but also show a focal lesion in the prostate with restricted diffusions (arrowhead) suspicious of prostate cancer. Prostate biopsy confirmed prostate cancer (Gleason 4+3).**

the patient depends on the clinical setting, the underlying primary malignancy, and the imaging findings.

A multidisciplinary team discussion can be very important in deciding on the clinical significance and management of an incidentally identified lesion. The need to perform further investigation will be determined by the clinical impact of the underlying nature of the incidentally identified lesion. For example, a patient with advanced malignancy or very poor performance status may not benefit from further investigation to determine if an incidental abnormality is an unusual metastasis, a second primary or a benign lesion.

Imaging in a cancer patient is typically performed for diagnosis, staging, treatment planning, response evaluation, follow-up and detection of recurrent disease. Therefore, evaluation of any lesion has to be within this clinical context. An incidental lesion in a patient undergoing staging investigations may potentially alter the tumour stage and therefore the lesion often requires further investigation to clarify its nature. However, if the imaging is being performed for treatment planning, even benign incidental findings may be highly significant, e.g. inguinal hernia or diverticular disease, when planning radiotherapy treatment.

The imaging modality used also has a bearing on the likelihood and nature of the incidental lesion. The detection rate for incidental lesions is significantly higher on CT than other imaging techniques[3]. However, the growing use of MRI is likely to identify lesions not previously seen on CT, e.g. unsuspected rectal or prostate cancer (Fig. 1) in pelvic imaging. fluorodeoxyglucose (FDG)-positron emission tomography (PET) also raises it own incidental findings and studies indicate that FDG-PET can detect new malignant tumours in 1–2% of asymptomatic individuals[4,5]. In the oncology patient, FDG-PET has frequently been shown to be more sensitive than CT in depicting occult foci of metastases or recurrent tumours undetected on CT. Also abnormal incidental foci of increased FDG avidity may be identified that are unlikely to be related to the neoplasm for which the patient was being scanned[6,7]. For all the cross-sectional imaging techniques, the need is similar: to distinguish whether the incidental lesion represents an unusual metastases; second malignancy; or benign abnormality.

Table 1 Incidental benign lesions on pelvic imaging

Site	Lesion
Gynaecological	Ovarian teratoma
	Ovarian/adnexal cyst
	Uterine fibroids
	Uterine calcifications
	Endometrial hyperplasia/polyp
	Bartholin cyst
Urological	Bladder diverticulum
	Bladder stone
	Undescended testis
	Prostate enlargement
	Bladder outlet obstruction
	Ureteric stone
	Scrotal hydrocoele
Gastrointestinal tract	Bowel obstruction
	Hyperplastic colonic polyp
	Hiatal hernia
	Bowel inflammation
	Diverticulosis
	Focal gastritis
	Inguinal hernia
	Rectal inflammation and/or haemorrhoids
Peritoneal cavity	Ascites
	Abdominal wall hernia
	Appendiceal stone
	Pelvic fluid collection
Vascular	Iliac artery aneurysm
	Atherosclerosis
	Vascular graft
	Thrombus
	Common femoral artery pseudoaneurysm
	Iliac artery ectasia
	Rectus muscle haemangioma
Musculoskeletal	Lytic bone lesion
	Sclerotic bone lesion
	Vertebral body deformation
	Spondylolisthesis
	Degenerative spine changes
	Diffuse osteopenia
	Spina bifida occulta
	Osteoarthritis
Miscellaneous	Lympadenopathy

Benign incidental lesions

When an incidental lesion is identified on imaging, one of the first things to determine, especially in oncology patients, is whether the lesion is benign or malignant. Table 1 lists some of the commoner incidental abnormalities that may be seen on pelvic imaging. Many abnormalities on imaging have characteristic features that allow for a confident diagnosis of a benign lesion (Fig. 2). However, some lesions need careful evaluation of the clinical and imaging features, e.g. complex adnexal masses and focal bowel wall thickening.

Adnexal masses

Adnexal masses are a common clinical problem, therefore it is not uncommon to identify adnexal masses when imaging the pelvis in a cancer patient. A retrospective study of 3448 CT scans found incidental adnexal lesions in 5% (168) of cases[8]. Of these 168 cases, 72 had an extra-ovarian neoplasm. In both pre- and post-menopausal women, most adnexal lesions were benign even in the presence of a known malignancy. In patients with known non-gynaecological malignancies, no primary ovarian neoplasms were discovered and only 3% had ovarian metastases all of which were in post-menopausal women. No primary ovarian malignancies were discovered incidentally in the non-oncology population[8]. Even in breast cancer, which has a propensity to metastasize to the ovary, a significant number of adnexal masses are benign. In a series of 121 patients with breast cancer who underwent resection of adnexal masses, 61 patients had benign and 60 had malignant adnexal disease[9]. These and other studies emphasize the fact the majority of adnexal incidentaloma, even in patients with known malignancies, are benign[10,11].

A recent review has outlined a practical approach to the management of adnexal incidentaloma[10]. In summary:

- A simple cyst <5 cm in a pre-menopausal women needs no further action.
- Cysts >5 cm in pre-menopausal women or cysts >3 cm in post-menopausal women need follow-up ultrasound.
- Specific diagnostic features of a benign mass (e.g. dermoid) needs no further action.
- A complex mass thought unlikely to be characterized by ultrasound needs MR imaging.

These recommendations are based on the recent guideline from Society of Radiologists in Ultrasound (SRU) and the utility of MRI in characterizing indeterminate adnexal masses[12,13]. The SRU guidelines indicate when and how ultrasound follow-up is required in asymptomatic adnexal cysts and stratify risk based on the size of masses and the menopausal status of the woman. They are very useful but expressly deal with asymptomatic women with a relatively low risk of malignancy but have limitations for other patient groups. Their advice relies heavily on watchful waiting as a discriminator. Follow-up in 6–12 weeks may not be appropriate in more complex adnexal incidentaloma and especially in cancer patients, who could have a metastatic lesion from a malignancy otherwise amenable to radical therapy.

Characteristics worrisome for malignancy on ultrasound are thick septations (>3 mm), solid elements with flow at Doppler ultrasound and focal wall thickening (>3 mm)[12]. A cyst with a nodule that has internal blood flow has the highest likelihood of being malignant. When staging investigations reveal such an adnexal mass, contrast-enhanced MRI can help guide further management[14,15]. Both MRI and ultrasound are highly sensitive, but MRI is more specific than ultrasound at identifying malignant masses. The greater specificity of MRI is due to its ability to correctly identify dermoid

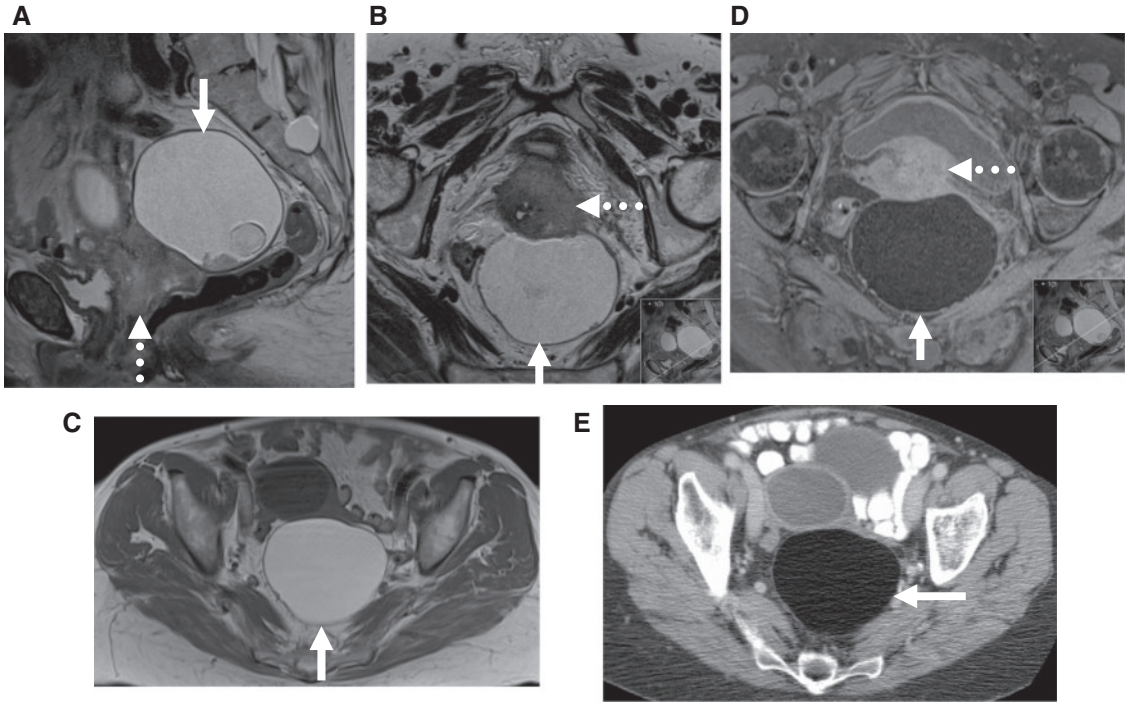

Figure 2 **Ovarian dermoid in a patient with stage IVA cervical cancer. (a) Sagittal and (b) oblique axial T2-weighted images through the cervix, (c) axial T1- and (d) fat-suppressed T1-weighted images shows cervical cancer (dotted arrow) with parametrial extension but also posterior bladder wall involvement (not illustrated). Incidental ovarian dermoid (arrow) can be seen behind the uterus. The dermoid shows the classic appearances with the fatty component showing loss of signal on the fat suppressed images. CT confirms the fatty nature of the ovarian dermoid.**

(Fig. 2), endometriotic cysts, and fibroids which may appear malignant at sonography[10,16].

Focal bowel wall thickening

It is not an uncommon to see focal areas of bowel wall thickening on CT (Fig. 3). Potentially these could be as a result of normal peristalsis or could represent benign or malignant pathology. Similarly using PET/CT, unexpected focal areas of increased FDG avidity are seen quite frequently. A few studies have investigated the incidence of significant clinical pathology, carcinoma in particular, in patients with these findings, to determine the need for further investigation with endoscopy, colonoscopy or surgery. There are differing opinions regarding the significance of focal colonic wall thickening. One study involved 94 patients, 48 of whom were suspected of having underlying carcinoma on the grounds of symptoms and signs (e.g. anaemia) and 46 who were asymptomatic. The results showed 34/48 (71%) of those with both wall thickening and symptoms had a positive colonoscopy (26 malignant and 8 benign pathology); compared with 16/46 (35%) of those with wall thickening alone, and the underlying cause for the wall thickening in these patients was due to benign disease (diverticular disease in 12 patients and benign polyps in 4). Thus, the conclusion was that further investigation with colonoscopy should be targeted to those suspected on clinical grounds to have an underlying malignancy[17]. However, 2 other studies targeting asymptomatic patients have demonstrated that endoscopic evaluation of focal areas of bowel thickening revealed an underlying neoplasm in 23–29% of cases. The conclusion in both studies was that patients with bowel wall thickening, even with no associated symptoms, signs or risk factors, should undergo endoscopy/colonoscopy[18,19]. The evidence for the need for further investigation when PET/CT reveals an unexpected area of increased FDG avidity is even more compelling. Two retrospective reviews showed that follow-up endoscopy or colonoscopy was positive in the area of focal FDG uptake in 71–84% of cases. The lesions detected were a spectrum of benign, pre-malignant and malignant pathologies[20,21].

Malignant incidental lesions

Unusual metastases

If a lesion appears suspicious for malignancy on imaging, the challenge then is in determining if it is an unusual metastases or second cancer (Fig. 3). In this regard, it is important to carefully review the clinical details, the nature of the primary and detailed evaluation of the imaging. If the diagnosis remains unclear, then further imaging and/or biopsy of the lesion may be needed.

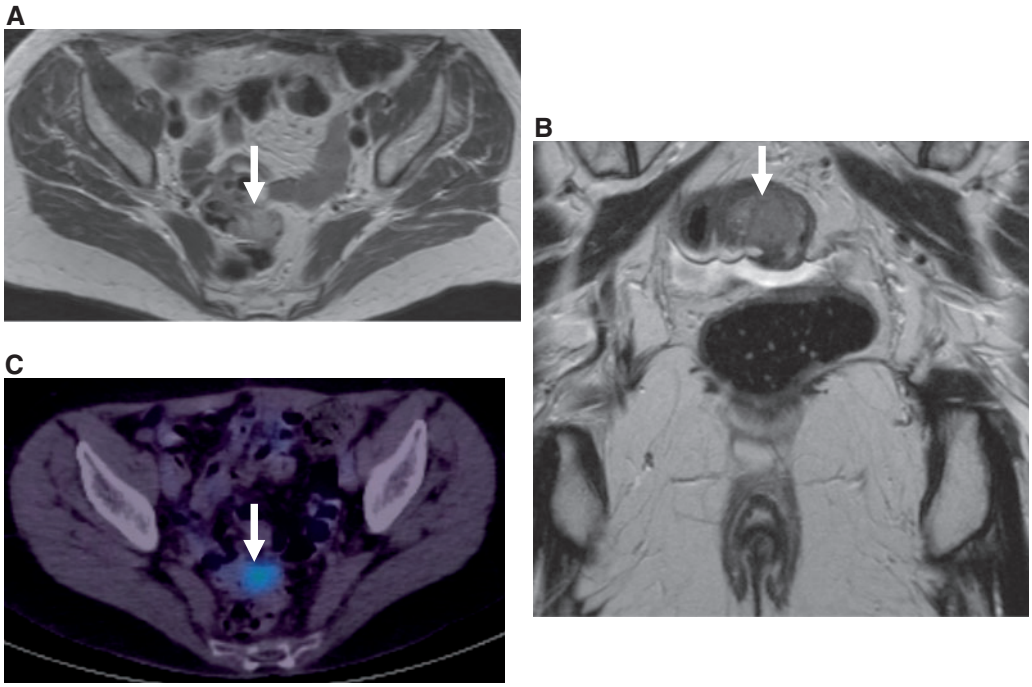

Figure 3 **Bowel lesion in a patient on follow-up for stage IC, grade 3 endometrial cancer. (a) Axial T2-weighted whole pelvis, (b) high-resolution coronal T2-weighted and (c) fused colour coded FDG-PET/CT images shows a focal lesion (arrow) in the sigmoid colon. A colonoscopy revealed a 2–3 cm polypoid mass in the distal sigmoid and the histopathology confirmed moderately differentiated adenocarcinoma in keeping with metastasis from the original primary.**

Understanding the spread of cancer is important in interpreting cancer imaging, but especially in identify sites of metastatic disease. Most cancers have a typical pattern of spread with direct extension, nodal, haematogenous and transcolemic spread. For example, peritoneal spread of disease is an expected finding in ovarian or gastrointestinal malignancy but a peritoneal lesion would be an unexpected finding in prostate cancer[22]. In the latter case, further investigations with biopsy or search for a secondary primary would be warranted.

However metastases can have an unusual pattern of distribution[23]. Clinical history can be important in interpreting unusual spread of disease. For example, in staging testes cancer it would be unexpected to find direct spread to iliac or inguinal nodes without abdominal adenopathy unless there is an identifiable predisposing factor such as cryptorchidism or previous scrotal surgery[24,25]. In a review of 1191 primary germ cell tumours, only 22 (1.8%) patients had iliac or inguinal lymphadenopathy. These patients had a history of mal-descent, congenital anomalies of the genitourinary system, or with bulky para-aortic disease[24].

In evaluating an incidental lesion it is very important to be aware of the underlying pathology (i.e. tumour type, grade, etc.) of the primary malignancy as this determines the likelihood and pattern of tumour spread. For example, in breast cancer, invasive lobular carcinoma is more likely than invasive ductal carcinoma to metastasize to the peritoneum (3.1% vs 0.6%) and to the gynaecologic organs (4.5% vs 0.8%)[26].

The extent of disease of the pre-existing primary tumour, i.e. stage, is also an important determinant of the likelihood of a lesion being a metastasis. A study of 54 patients with breast cancer and adnexal masses discovered on cross-sectional imaging found ovarian metastases in 58% of all patients with stage IV breast cancer but no ovarian metastases in early stage breast cancer[27].

Isolated metastases are unusual and generally need further validation with follow-up imaging or biopsy. In a large retrospective study of 2426 breast cancer patients, pelvic metastases on CT was the only site of metastasis in 0.5% of patients and 0.2% had new or enlarging pelvic metastases despite the presence of stable extra-pelvic metastases[28]. The pelvic metastases were mainly in the bone and adnexa. This study also highlighted that 254 additional examinations were carried and 84.6% of these tests yielded normal, benign, or indeterminate results.

Understanding what tumour metastasizes to a particular site is useful to know. Using metastases to the ovary as an example, these account for approximately 10% of ovarian cancers. The most frequent neoplasms to metastasize to the ovaries are breast, colon and gastric carcinomas, and lymphoma. Endometrial carcinoma, melanoma, pancreatic carcinoma, and carcinoid tumour have also been reported to metastasize to the ovary. The Krukenberg

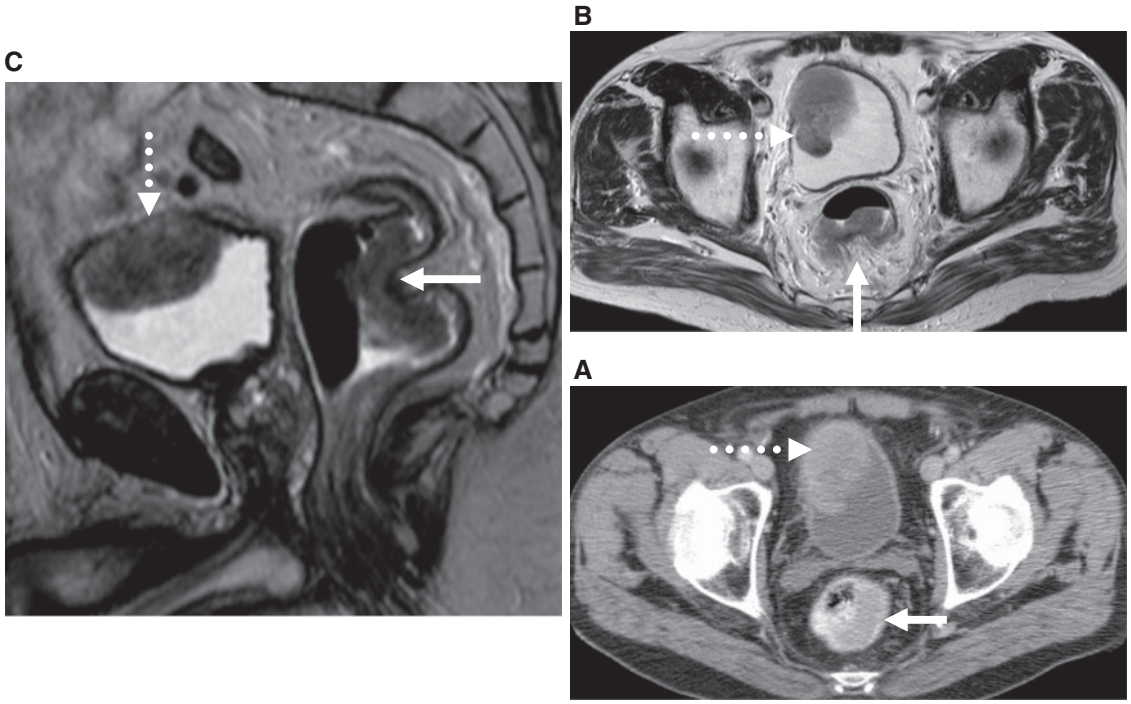

Figure 4 **Synchronous bladder and rectal carcinoma. (a) CT, (b) axial and (c) sagittal T2-weighted MR images in a man who presented with haematuria and diarrhoea and was found to have synchronous small cell bladder (dotted arrow) cancer and rectal adenocarcinoma (arrow) confirmed at pathology.**

tumour refers to metastasis consisting of mucin-filled signet ring cells in a cellular stroma, usually from a carcinoma of the gastric antrum but is often now used as a synonym for metastases to the ovary. Non-ovarian primary neoplasms have often been diagnosed before an ovarian mass is found. However, it is not uncommon that metastatic ovarian neoplasm is recognized before the primary neoplasm is known[29].

In clinical practice, unusual sites of metastases are more often seen with the common tumour types, e.g. breast and lung cancer. However, certain tumour types are prone to unusual spread and cutaneous melanoma is arguably the most widely metastasizing neoplastic disease and it has a particularly unpredictable pattern of spread[30]. Unusual spread may also be seen in advanced stage disease, late relapse, as a consequence of treatment[31].

Imaging features can sometimes be an indicator of a lesion being a metastasis. Metastases to the ovary are typically bilateral, solid, and strongly enhancing but cystic and necrotic areas are common. The overlap of radiologic appearances between primary ovarian cancer and metastases to the ovaries is substantial and no imaging feature seems to be highly accurate in the distinction between primary and secondary ovarian malignancies[29]. The clinical or imaging context may be helpful because in patients with metastases to the ovaries, the primary tumour is often clinically overt and associated with findings of widespread metastatic disease. A multi-locular cystic mass at ultrasound or MRI is more likely to be a primary ovarian neoplasm than a secondary ovarian neoplasm. A more solid mass on MRI or a relatively high resistive index in the wall of the mass at Doppler ultrasound also favours diagnosis of a secondary neoplasm[29].

Second malignancy

An incidental lesion may represent a second malignancy rather than a metastasis. On imaging alone it is not possible to determine if a malignant-appearing lesion is a second malignancy or a metastasis. Further management will depend on the clinical assessment and further investigation including pathological verification.

A second malignancy may represent synchronous cancers (Fig. 4) (i.e. cancers detected simultaneously) or metachronous cancers (i.e. cancer with an interval between detection of the first malignancy and detection of a subsequent tumour). Both synchronous and metachronous primaries can occur in the same organ, e.g. within the bowel or urothelial tract.

Multiple malignancies should be considered as some cancers tend to cluster because of shared risk factors (e.g. smoking) in cancers of the lung and of the head and neck, dietary or endocrine factors in gynaecologic cancers, ultraviolet light in melanoma and skin cancer, and viral agents in cervical and ano-genital cancers. Genetic and familial risk factors should also be considered in multiple tumours. Most cases of hereditary breast/ovarian cancer families are associated with BRCA1 and

BRCA2 mutations. The lifetime risk for developing ovarian cancer for BRCA1 carriers is 16–44% and for BRCA2 carriers is 27%. The Lynch (hereditary non-polyposis colorectal cancer) syndrome is characterized by colon cancer, endometrial cancer, breast cancer, urothelial tumours and ovarian cancer.

A second malignancy may develop in a cancer patient due to the potentially carcinogenic treatment of the initial cancer, such as chemotherapy, radiation therapy, or both. In testes cancer patients, there is a reported 10% excess lifetime risk of a second malignancy in patients treated with radiotherapy, chemotherapy or both after 30 years of follow-up[32]. Similarly, among survivors of cervical cancer the risk of all second cancers is increased by 30%[33]. Those treated with radiotherapy are at increased risk of second cancers at sites in close proximity to the cervix beyond 40 years of follow-up[33]. Population studies have reported that up to 8.5% of cancer patients were subsequently proven to have another primary cancer[34,35].

Summary

Incidental lesions are not uncommon in cancer patients and in most cases these lesions are likely to be benign. However, the management and the likelihood that such a lesion is malignant are dependent on many factors. Therefore, careful evaluation of the patient history and the imaging is needed to distinguish between a benign lesion, unusual metastatic disease and second malignancy. A multi-disciplinary team discussion is very important in this regard in order to decide what further investigations are required and thus inform decision making on treatment pathways.

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