Management of a pelvic mass

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Abstract

The presence of a pelvic mass is a common clinical problem. A combination of findings from the clinical history, examination and results of various investigations can help to determine the character and origin of the mass, determine risk of malignancy and guide management strategies. This problem-based review presents three case histories that illustrate some of the key principles in the management of a pelvic mass. The cases, which include a leiomyosarcoma, an adnexal mass in pregnancy, and a tubo-ovarian abscess, describe commonly encountered clinical scenarios with an evidence-based approach to subsequent management.

Keywords leiomyosarcoma; ovarian malignancy; pregnancy; surgery; tubo-ovarian abscess; uterine malignancy

Introduction

An adnexal mass is a common clinical problem affecting the ovary, fallopian tube or surrounding connective tissue, and can present in females of all ages. Mostly, they arise from the ovary. An adnexal mass may be symptomatic or discovered incidentally during imaging performed for another indication. The differential diagnosis of an adnexal mass is broad (Table 1). The most serious concern, and consequently the primary aim of investigation, is the identification of malignancy.

Case 1

A 59-year-old woman was referred urgently to the gynaecology–oncology clinic complaining of post-menopausal bleeding (PMB) and increasing abdominal-girth. Associated symptoms included constipation, abdominal pain and urinary urgency over the last 2 months. She was otherwise healthy. Examination revealed a pelvic mass extending to the umbilicus; it was not clear whether the mass originated from the uterus or ovary.

Discussion

This clinical presentation was highly suspicious of pelvic malignancy. The patient's symptoms met the criteria for a "2-week wait" referral according to the National Institute for Clinical Excellence (NICE) recommendations for ovarian cancer management. These include (in women over 50 years) bloating, pelvic or abdominal pain, feeling full or loss of appetite, urinary frequency and/or urgency and new-onset irritable bowel symptoms. Her presentation warranted investigation by the general practitioner with a cancer antigen 125 (CA125) level: this is elevated in up to 80% of ovarian cancers, but also with many other gynaecological and non-gynaecological pathologies (Table 2). This affects the specificity of the test. Levels above 35 IU/ml merit a trans-vaginal and/or trans-abdominal ultrasound-scan (USS) and in the presence of an ovarian cyst, calculation of a Risk of Malignancy Index (RMI) (see Table 3). The patient also reported PMB, which is defined as vaginal bleeding more than 1 year after the last menstrual period. 1–24% of such women have a diagnosis of uterine malignancy and warrant urgent referral for a trans-vaginal USS. The endometrial-thickness is measured, and if >4 mm, an endometrial biopsy is indicated. Other common causes include genital tract atrophy, endometrial polyps and hyperplasia.

Further case history

A trans-vaginal and abdominal USS identified a 26-week-pregnancy-sized fibroid uterus with a significantly thickened endometrium. Surprisingly, a pipelle© biopsy identified a leiomyosarcoma (LMS). A chest X-ray and pelvic magnetic resonance imaging (MRI) were performed for staging, and suggested stage 1B disease (Figure 1 and Table 4). The patient was referred to a gynaeoncology centre and discussed at the multidisciplinary team (MDT) meeting. She was treated with a midline laparotomy, total abdominal hysterectomy, bilateral salpingo-oopherectomy and omentectomy. There was no evidence of extra-uterine spread. Histological examination confirmed a grade III (high grade) LMS with a tumour mass of 15 cm (stage IB). Further MDT discussion at both the cancer centre and regional sarcoma centre concluded that neither adjuvant chemotherapy nor radiotherapy was indicated. This reflects the current lack of improved survival in the relatively limited RCTs with either chemotherapy or radiotherapy. There are ongoing trials looking at more novel regimes, which it is hoped will provide more favourable results. In keeping with many rare tumour types, practice may vary considerably between institutions and individual clinicians. The patient was followed up with 4-monthly chest X-ray and pelvic MRI, and counselled about the high risk of recurrence.

Discussion

Uterine sarcomas are a rare group of soft tissue tumours, originating from mesenchymal cells and include myometrium or endometrial connective tissue elements. They comprise less than 1% of gynaecological malignancies and between 3–7% of uterine malignancies. When compared to the other uterine cancers, sarcomas are more aggressive and carry a far worse prognosis, even when correcting for stage.

They are classified according to their distinct tissue types and presumed origin:

- Carcinosarcomas (40%)
- Leiomyosarcomas (40%)

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Differential diagnosis of a pelvic mass

Organ	Causes
Ovary	Functional/physiological cysts
	Benign tumours/cysts
	Borderline/malignant tumours
	Endometrioma
	Ovarian hyper-stimulation syndrome
	Metastatic ovarian tumours (e.g. breast, colon)
Uterus	Pregnancy
	Fibroids (e.g. pedunculated, broad ligament)
Fallopian tube	Hydrosalpinx
	Tubo-ovarian abscess
	Ectopic pregnancy
	Fimbrial cyst
	Fallopian tube carcinoma
Bowel	Appendix abscess
	Diverticular disease
	Colorectal carcinoma
	Constipation
Miscellaneous	Urinary retention
	Pelvic kidney
	Retroperitoneal neoplasms
	Lymphoma
	Omental cyst

Table 1

Conditions associated with an elevated serum CA125 concentration

Benign gynaecological conditions	Adeonomyosis
	Benign ovarian neoplasms
	Endometriosis
	Functional ovarian cysts
	Leiomyomata
	Meig's syndrome
	Menstruation
	Pregnancy
	Ovarian hyper-stimulation
	Pelvic inflammation
Gynaecological cancers	Epithelial ovarian cancers
	Endometrial cancers
	Adenocarcinoma of the cervix
	Other tumours of the ovaries
Non-gynaecological conditions	Liver disease
	Diverticulitis
	Ascites
	Congestive heart failure
	Diabetes
Non-gynaecological cancers	Colon
	Breast
	Pancreas

Table 2

- Endometrial stromal sarcomas (10–15%)
- Undifferentiated sarcomas (5–10%).

There are no symptoms specific to LMS, however women present most commonly with abnormal vaginal bleeding. As reported by this patient, associated complaints include pressure symptoms (bladder and bowel changes), abdominal distention, or notice a lump is arising from the pelvis. Presentation is very similar to leiomyomas (fibroids). Fibroid growth is dependent on oestrogen, so uterine or fibroid enlargement in hypo-oestrogenic post-menopausal women should cause concern. The reported age range at LMS diagnosis varies between 22–89 years, with a median of between 47–56 years. Risk factors include nulliparity, obesity, increasing age, tamoxifen use, and a history of pelvic radiation. There is an association with oestrogen excess, although this appears to be a weaker link compared with endometrial carcinoma.

Unfortunately LMS is often diagnosed post-operatively. In a study of 106 women with LMS, 35% were diagnosed following myomectomy or hysterectomy for a presumed diagnosis of benign leiomyomas. Fibroids have not been found to develop into LMS, but tumour can co-exist within a fibroid; 0.5% of women having surgery for presumed fibroids have been diagnosed with underlying LMS. The current NICE guidelines for heavy menstrual bleeding recommend non-surgical management of fibroids as first line (including the Mirena intra-uterine system, progestogens, GnRH analogues and uterine artery embolization). Increasing adoption of conservative techniques in fibroid management may lead to a delayed diagnosis of LMS which, in turn, may affect long-term prognosis.

Histological examination is the only way to confirm the diagnosis of uterine sarcomas. As in this case, diagnosis can be made by endometrial sampling. The success of this for LMS relies on the tumour reaching and invading the surface of the endometrial cavity. Therefore, test sensitivity is limited by the fact that significant numbers of LMS may not meet the 5 mm endometrial-thickness criteria or affect the endometrium at all. Imaging such as USS, MRI and computed tomography (CT) cannot reliably distinguish between fibroids and LMS, or other pathology (adenomyosis, endometrial carcinoma, lymphoma). However, MRI may show features associated with LMS so should be the imaging of choice. Trans-cervical needle biopsy with MRI has been used to distinguish between fibroids and LMS. Intra-operative frozen section for suspicious-looking fibroids is not always accurate, resulting in inadequate staging. If LMS is histologically confirmed prior to surgery, imaging is utilized to assess size of tumour, and evidence of metastases. In early stages, unlike endometrial cancer which is dependent on the depth of myometrial involvement, LMS staging is determined by the size of the uterine tumour (see Table 4).

LMS management is coordinated through a gynae-oncology MDT within a cancer centre. Research suggests prognosis is improved if there is no residual disease following surgery; therefore aggressive de-bulking (as for ovarian malignancy) offers the best possible outcome. As in this case, it should include a total abdominal hysterectomy, bilateral salpingo-oopherectomy (BSO) and surgical staging (peritoneal washings, omental biopsy and biopsy of any suspicious areas). Lymph node metastasis has been reported in less than 5% for early stage cases. If there is evidence of enlarged nodes a de-bulking

Risk of malignancy Index: U x M CA125 (RMI)			
U: Ultrasound score • Suspicious features: multilocular cysts, solid areas, metastases, ascites and bilateral lesions.	0	0 suspicious feature	
	1	1 suspicious feature	
	3	2–5 suspicious features	
M: Menopausal status	1	Pre-menopausal	
	3	Post-menopausal	
CA125	• Absolute value in U/ml		
Risk assessment according to RMI			
Risk	RMI	% of women	Risk of malignancy (%)
Low	<25	• 40%	• <3 %
Moderate	25–250	• 30%	• 20%
High	>250	• 30%	• 75%
Source: Davies AP, et al. *Br J Obstet Gynaecol* 1993; 100: 927–31			

Table 3

lymphadenectomy can be performed. For women with extra-pelvic disease (stage 3 or above), management should take into account patient wishes, co-morbidities and disease extent. In the context of stage IV disease surgery may only be appropriate for symptom control (e.g. to palliate bleeding).

When an unexpected histological diagnosis is made following myomectomy, hysterectomy and full surgical staging is recommended. If diagnosis follows a hysterectomy, further staging with imaging of chest, abdomen and pelvis is required but no additional surgery is usually recommended. Ovarian metastases do occur and some tumours express oestrogen receptors, however it is not clear whether removing the ovaries influences survival. If a decision is made for conservation of the ovaries or uterus in young women, detailed counselling is required to highlight the high risks of recurrence and need for close follow-up.

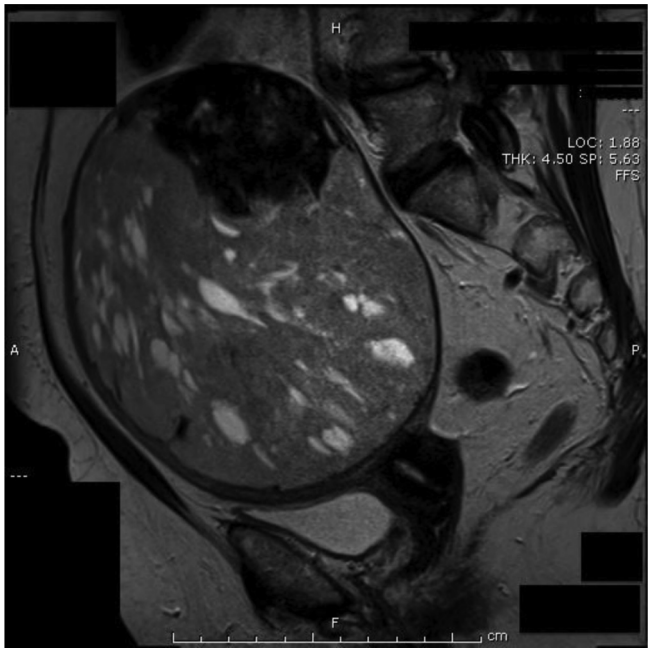

Figure 1 Pelvic MRI of uterine leiomyosarcoma. The endometrium is obscured by the large mass, with evidence of cystic degeneration and bleeding within the lesion.

Adjuvant therapy includes chemotherapy and radiotherapy, however the benefits of these are debated. Many studies have been limited by poor methodology and under-powering, so results are often conflicting. Chemo-radiotherapy in combination has shown to be detrimental due to significant toxicity. Pelvic radiotherapy has demonstrated a reduction in local recurrence rates, however, there is no benefit to overall survival; consequently this is not routinely recommended in the UK. In comparison, chemotherapy has demonstrated a modest reduction in relapse rates and prolonged survival in advanced cases. Some chemotherapeutic agents with demonstrated activity include anthracycline-based doxorubicin, cyclophosphamide, the nucleoside analogue gemcitabine and taxanes.

Various studies show 5-year survival rates ranging from 62–65% for stage 1, and as low as 29% for advanced disease. Only 30–50% of women with high-grade disease remain progression-free at 2 years with tumour staging being the most reliable prognostic factor. Other prognostic factors include tumour grade and mitotic count, age, use of adjuvant therapy, and extent of surgical clearance. As such, close post-treatment surveillance is required due to the tumour's aggressive nature and high risk of recurrence. Currently, there is no consensus regarding ideal follow-up regimes. Common practice includes

FIGO staging

Leiomyosarcoma			Endometrial malignancy		
Stage	**Definition**		**Stage**	**Definition**	
1	Tumour limited to uterus		1	Tumour limited to uterus	
	1A	<5cm		1A	<50% myometrial invasion
	1B	>5cm		1B	>50% myometrial invasion
II	Tumour extends beyond the uterus, within the pelvis		II	Tumour extends into the cervix	
	IIA	Adnexal involvement			
	IIB	Involvement of other pelvic tissues			
III	Tumour invades abdominal tissues (not just protruding into the abdomen)		III	Tumour extends into pelvic structures	
	IIIA	One site		IIIA	Serosal or adnexal involvement
	IIIB	> 1 site		IIIB	Vagina and/or parametrium
	IIIC	Metastasis to pelvic and/or para-aortic lymph nodes		IIIC1	Pelvic lymph node involvement
				IIIC2	Para-aortic lymph node involvement
IV	Metastasis		IV	Metastasis	
	IVA	Tumour invades bladder and/or rectum		IVA	Tumour invades bladder and/or rectum
	IVB	Distant metastasis		IVB	Distant metastasis including abdominal metastases and/or inguinal lymph nodes

FIGO staging for uterine sarcomas. Int J Gynaecol Obstet 2009;104:179.

Table 4

clinical examination and imaging of pelvis, abdomen and chest every 3–4 months for 2–3 years, then 6-monthly for a further 2 years.

Case 2

A 28-year-old woman presented at 10-weeks gestation in her first pregnancy with a sudden onset of left-sided abdominal pain, nausea and vomiting. She was apyrexial. Abdominal examination revealed mild tenderness in the left lower quadrant but there was no evidence of guarding or rebound tenderness. A full blood count showed mild leucocytosis. Other laboratory investigations were normal. The patient was admitted and given intravenous fluids, analgesics and anti-emetics. An USS demonstrated a viable intra-uterine pregnancy and an 8 × 7 × 8 cm mass arising from the left adnexal. A diagnostic laparoscopy was performed due to the clinical suspicion of ovarian cyst torsion. Intraoperatively the diagnosis was confirmed and a laparoscopic left oophorectomy was performed. Histology demonstrated a torted and partially infarcted mature teratoma. The postoperative period was uncomplicated. The remainder of the pregnancy was uneventful and the patient had a spontaneous vaginal delivery of a healthy baby at term.

Discussion

The increase in use of antenatal USS has led to a higher detection rate of asymptomatic ovarian cysts in pregnancy. The reported incidence of antenatal ovarian cysts ranges from 0.2%–2%, depending on diagnostic method (examination or USS) but most of these are benign. As was seen in this case, dermoid cysts (mature cystic teratoma) are the most frequent histological type found. Other likely causes of adnexal masses in pregnancy include simple or haemorrhagic cysts, endometriomas and

fibroids. The reported risk of malignancy of an ovarian mass in pregnancy varies from 0.93% to 3.4%; the probability of developing an ovarian malignancy during the reproductive years is approximately 0.01%.

Non-specific symptoms of ovarian cysts include abdominal or back pain (with or without radiation to the thigh), constipation or urinary symptoms, all of which can be normal in pregnancy, and consequently probably would not prompt investigation. Acute onset pain may result from torsion. An adnexal or Pouch of Douglas mass may be identified on routine antenatal examination. However, most cysts are incidental findings on USS.

USS can be used to characterize ovarian masses reliably, although histological examination is required to confirm the diagnosis. Ultrasonographic features suspicious of malignancy include the presence of bilateral lesions, solid components, septations or the presence of ascites. For pre-menopausal women, instead of using the RMI, the International Ovarian Tumour Analysis (IOTA) group, suggested "B" (benign) or "M" (malignant) rules, and reported a sensitivity and specificity of 95% and 91% respectively (see Table 5). Evidence suggests that the malignancy risk is greater when the growth rate is $\geq$3.5 cm per week. Tumour marker specificity is low in pregnancy because levels are elevated in normal pregnancy and fluctuate with gestational age. Alpha-fetal protein and human chorionic gonadotropin are synthesized by the placenta. The CA125 rise is thought to be due to decidual cell production, and occurs mainly in the 1st trimester, followed by a gradual decline in the 2nd and 3rd. Consequently, after the 1st trimester, markedly elevated levels of CA125 or a significant increase during consecutive measurements should raise the suspicion of malignancy. It has been suggested that a more appropriate cut-off value for maternal serum CA125 levels during pregnancy may be 112 IU/mL. If an ovarian mass is suspicious of malignancy a gynae-oncologist's opinion should be sought.

Ovarian cysts without suspicious features can be managed conservatively during pregnancy. In the majority of cases cysts will resolve by the second or third trimester. Asymptomatic simple ovarian cysts <5 cm do not necessarily need follow-up or surgical intervention. Larger simple cysts should be a reviewed with a repeat USS in 4 weeks: most will have resolved. All suspicious cysts of any size should have repeat USS every 4 weeks to identify growth. Further growth of dermoid cysts less than 6 cm is unlikely, so conservative management should be offered, with ultrasonographic follow-up postnatally.

IOTA group ultrasound rules for ovarian cyst classification

"B" rules	"M" rules
Unilocular cysts	Irregular solid tumour
Presence of solid components when the largest solid component <7 mm	Ascites
Presence of acoustic shadowing	At least four papillary structures
Smooth multilocular tumour with a largest diameter <100 mm	Irregular multilocular solid tumour with largest diameter >100 mm
No blood flow	Very strong blood flow

Table 5

Complications include torsion, rupture, haemorrhage and obstruction of labour. The incidence of cyst torsion in pregnancy is higher than in the non-pregnant population at up to 15%, and most commonly occurs when measuring between 6–8 cm. One study reported that up to 60% of torsion cases occur between 10 and 17 weeks gestation; the same study found that only 6% of cases of ovarian torsion occurred after 20 weeks of gestation. The pathophysiological mechanism that increases the torsion risk in pregnancy is unclear. Assisted reproductive techniques are known to cause an increase in the size of the ovary, and both the size and number of cysts; this makes torsion more likely. Other proposed mechanisms are the presence of enlarged corpus luteum cysts and the laxity of the supporting tissues of the ovary. As the pregnancy advances the risk of torsion reduces because the ovaries are pushed out of the pelvis and against the abdominal wall by the enlarging uterus.

Ovarian torsion in pregnancy presents with the same clinical symptoms as in non-pregnant women, with lower abdominal pain, nausea, vomiting and low-grade fever. Physical examination in pregnancy is often difficult due to changes in the position of intra-abdominal organs and may not be informative. Laboratory tests are also non-specific: leukocytosis can occur, C-reactive protein (CRP) levels may be elevated and electrolyte abnormalities can occur due to prolonged vomiting. USS can detect an adnexal mass, although has limited ability to determine if torted. Doppler blood flow imaging has a high false-negative value and a normal study cannot reliably exclude torsion. MRI (without gadolinium) can be used in pregnancy, but also has limited ability to confirm or exclude torsion, and has no benefit over USS. CT is contra-indicated in pregnancy to avoid fetal radiation exposure.

Surgery should be avoided during pregnancy but if required, it should ideally be performed in the early to mid second trimester. At this stage the background risk of miscarriage is reduced and organogenesis completed: evidence suggests there is no association with significant preterm labour, fetal loss or risk of teratogenicity. At this stage of pregnancy the operative exposure to the pelvis is not restricted significantly by the enlarged uterus. From the late second trimester onwards the uterus impairs the surgical exposure to the pelvis. Third trimester surgery has been reported to be associated with preterm labour but not fetal loss.

In pregnancy a modified perioperative approach is required due to increased risk of potential surgical and anaesthetic complications secondary to physiological maternal adaptations. These changes include increased swelling of the upper airways, reduced gastric emptying, gastroesophageal sphincter relaxation, tidal volume increase, reduced blood pressure due to uterine compression of the inferior vena cava, and an increased thrombotic tendency. Preoperative thromboprophylaxis, hydration and gastro-oesophageal reflux prophylaxis (H2 antagonists) are recommended to reduce complications. Maternal surgical complications in pregnancy include miscarriage, anaesthetic risks (e.g. pulmonary aspiration, intubation difficulties), haemorrhage and venous thromboembolism. When the surgical procedure involves removal of the corpus luteum before 7–9 weeks of gestation, progesterone supplementation is recommended to reduce the miscarriage risk. After this period, placental tissue

takes over progesterone production and exogenous replacement is not required. It is also advised that uterine manipulation should be minimal.

Laparotomy has been the mainstay of surgical treatment for ovarian masses in pregnancy. A midline skin incision is recommended to facilitate exposure due to presence of the gravid uterus. The decision to perform cystectomy or oophorectomy is based on the size of the cyst, the degree of suspicion of malignancy, vascular compromise and the appearance of the contra-lateral ovary. Salpingo-oophorectomy is the procedure most commonly performed in such cases, although de-torsion of the ovary, cystectomy and adnexal fixation could be considered in carefully selected cases. Spillage of cyst-content should be avoided in cases of suspected malignancy. Laparoscopic surgery appears to be safe in pregnancy. However, concerns include uterine trauma during the insertion of Verres needle or trocars, decrease in the uterine blood flow due to raised intra-abdominal pressure and absorption of carbon dioxide by the fetus. Laparoscopic procedures performed using an open entry technique and port site placement under direct vision can theoretically reduce the risk of injury to the gravid uterus and are recommended. Women diagnosed with cysts during pregnancy should have antenatal discussion about potential management if a caesarean section is performed for obstetric reasons.

In this case, emergency surgery was indicated as the clinical presentation with sudden onset of pain with associated nausea and vomiting was highly suspicious of ovarian torsion. Although these symptoms were non-specific and the differential diagnosis could include appendicitis, gastroenteritis or pelvic inflammatory disease, the detection of the ovarian mass on USS further supported the suspected diagnosis. The risk of surgery had to be balanced against the risk of delaying surgery: conservative management could have resulted in ovarian infarction, haemorrhage or peritonitis, which may have lead to an increased morbidity and miscarriage rate.

Case 3

A 35-year-old woman was referred to the emergency gynaecology service complaining of lower abdominal pain. Ten days previously, she had had normal pelvic USS and a hysterosalpingogram (HSG) as part of infertility investigations. Her past medical history was unremarkable and she reported no previous sexually transmitted infections or pelvic inflammatory disease.

On admission, the patient was apyrexial and a urine pregnancy test was negative. Examination revealed mild tenderness and a palpable mass in the lower abdomen but no signs of peritonism. An USS revealed a 12 cm complex pelvic mass of uncertain origin. Biochemical investigations showed a raised CRP level (>320) and raised serum CA125 (2100 U/ml). The patient was treated with broad-spectrum antibiotics for suspected pelvic infection.

An MRI scan 2 weeks later showed no significant change in the size of the mass. The findings were suggestive of a tubo-ovarian abscess (TOA). The serum CA125 level had reduced markedly to 700 U/ml. A diagnostic laparoscopy was performed which revealed a left-sided TOA that was drained. Postoperative recovery was uncomplicated.

Discussion

A TOA is an inflammatory mass involving the ovary, fallopian tube, or occasionally, neighbouring structures. TOA can complicate pelvic inflammatory disease (PID) in up to 15% of women; reported rates are higher in women hospitalized for acute PID. TOA may also follow pelvic surgery or result from bowel perforation and intra-peritoneal spread of infection, but it typically results from upper genital tract infection. In post-menopausal women, the diagnosis of TOA should trigger investigations to exclude malignancy or other pelvic pathology. The most common organisms isolated from TOA are streptococcal species, *Escherichia coli* and other Gram-negative enteric organisms. The most frequent anaerobes are Bacteroides and Peptostreptococcus. There are currently no clear risk factors for TOA among PID patients. However, risks of developing PID include multiple sexual partners, age 15–25 years, and previous pelvic infection. The spread of pathogens to the upper genital tract in this case was a consequence of HSG. The rate of infection of the upper genital tract following HSG is approximately 1% and is more common in women with previous PID history.

Abdominal and/or pelvic pain are the most common features of TOA, but fever and leucocytosis are also common (found in 60–80% of patients), along with vaginal discharge or change of bowel habits. As with other abscess locations, fever can be low-grade or with intermittent spiking. A detailed sexual history should be completed. Abdominal and vaginal examination may reveal peritonism, a pelvic mass, cervical excitation or vaginal discharge.

The imaging method of choice is ultrasonography with sensitivity and specificity 82% and 91% respectively. The classical USS features of a TOA are masses that are relatively homogeneous, well demarcated, cystic and thin-walled, which contain speckled fluid with internal echoes consistent with inflammatory debris. An air fluid level and septations may be seen. Laboratory investigations should include full blood count, CRP, and tests for renal and liver function. Although leucocytosis and elevated CRP levels have limited value in the diagnosis of TOA, the results can be used as an indicator of the disease severity and to monitor the treatment response. Baseline renal and liver function tests are required to identify and monitor dysfunction of these organ systems secondary to sepsis. In the presence of fever, urine and blood cultures should be performed. Gram stain and microscopic examination of the vaginal discharge in combination with nucleic acid amplification tests for chlamydia and gonococcus may provide useful information necessary to guide the antibiotic regime used.

CA125 is known to rise in ovarian cancer. However elevated serum levels are also observed in a variety of benign conditions and approximately 1% of healthy women; levels can also fluctuate during the menstrual cycle (Table 2). The presence of pleural or peritoneal fluid, or disease involvement of a serosal surface (whatever the organ) may also increase CA125 levels. A CA125 is not routinely performed for TOA, however, it was in this case due to the presence of an adnexal mass. The level was significantly raised due to peritoneal irritation from the ongoing inflammatory process. The marked decrease in CA125 following antibiotic treatment was in keeping with resolving intra-peritoneal inflammation; levels that increase or remain static would be more suggestive of malignancy. In cases when an initial diagnosis has not been confirmed and malignancy has not be excluded, CA125 should be repeated after completion of antibiotics.

Introduction of more effective broad-spectrum antibiotics over the last 20 years has had a significant affect on the success of

TOA's medical treatment, and has reduced surgical intervention. Medical treatment alone is generally recommended in the following scenarios: a haemodynamically stable patient, abscess size less than 9 cm, pre-menopausal women and an adequate response to antibiotics. Immunocompromise alone is not an indication to proceed to surgical treatment immediately. The choice of antibiotic should be guided by local microbiology guidelines and drug sensitivity patterns. Intravenous triple antibiotic therapy including a broad-spectrum beta-lactam, (such as ceftriaxone) in combination with metronidazole or clindamycin (for anaerobic coverage) and gentamycin is suggested. Triple drug regimen is shown to be more effective for the treatment of TOA when compared to double regimens (beta-lactam antibiotic and doxycyline, or clindamycin and gentamycin). Inpatient management for all cases of TOA is recommended. Careful monitoring with the use of early warning scores is recommended to assess response to treatment and identify possible deterioration, and the National Patient Safety "sepsis bundle" should be implemented as necessary.

For patients that respond to medical management, antibiotic therapy should be continued for at least two weeks. Regular monitoring is required; it is important to remember that resolution of the abscess may take several months. Medical treatment alone is effective in 34–87.5% of patients with TOA. Clinical improvement including resolution of the pain and fever, and falling leucocytosis and CRP levels can be used to monitor the treatment response. If no improvement is seen within 48–72 hours of medical management, the patient should be evaluated for surgical intervention. By either laparoscopy or laparotomy, the aim is to be as conservative as possible, because most women with TOA are of reproductive age and wish to retain all pelvic organs. Further objectives include confirmation of TOA, drainage of the abscess, removal of the abscess cavity along with inflammatory and infective debris, and peritoneal-cavity irrigation.

In selected cases first line surgical intervention should be considered. If rupture is suspected (in the context of severe pain, peritonism and signs of septic shock), immediate surgical management is indicated in combination with intravenous antibiotics.

An alternative approach to surgical intervention is trans-vaginal or percutaneous abscess drainage. A large retrospective study reported a success rate of up to 93% when women were treated with a combination of intravenous antibiotics and ultrasound-guided trans-vaginal drainage. The authors found that the procedure was generally well tolerated and minimally invasive, thus avoiding the potential risks associated with general anaesthesia and surgery.

Prior to discharge from the hospital, patients should be advised to use barrier contraception in addition to any hormonal methods, to avoid pregnancy during the treatment period. Referral to the genito-urinary medicine team is necessary for follow-up and appropriate contact tracing. Careful counselling is also required concerning the long-term complications of TOA, such as chronic pelvic pain, infertility and ectopic pregnancy. ◆

FURTHER READING

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Practice points

- Uterine and fibroid enlargement in post-menopausal women is abnormal and should prompt investigation and referral.
- Leiomyosarcomas account for less than 1% of gynaecological malignancies and 3–7% of uterine malignancies.
- Fibroids do not develop into leiomyosarcomas, but tumours can co-exist within fibroids and are occasionally diagnosed unexpectedly following hysterectomy or myomectomy.
- Complications of the presence of ovarian cysts in pregnancy include torsion, rupture, haemorrhage and obstruction of labour.
- The incidence of ovarian torsion in pregnancy is higher than in non-pregnant women.
- Maternal serum CA125 levels increase in the first trimester of pregnancy and decline during the second and third trimesters.
- If elective surgery is indicated in pregnancy it should be performed in the early to mid second trimester, if possible.
- Laparoscopic surgery for ovarian cysts appears to be safe in pregnancy.
- Tubo-ovarian abscesses (TOA) can complicate PID in up to 15% of women.
- Serum CA125 levels are elevated in the presence of TOA and tend to decrease following treatment.
- Intravenous triple antibiotic therapy including a broad-spectrum beta-lactam, such as ceftriaxone or cefuroxime in combination with metronidazole or clindamycin for anaerobic coverage and gentamycin is the recommended treatment for TOA.
- If there is no response to medical treatment of TOA within 48–72 hours the patient should be evaluated for surgical management.