BMJ Case Reports

Unusual association of diseases/symptoms

Abdominal swelling in two teenage girls: two case reports of massive ovarian tumours in puberty

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Summary

The following report describes two 15-year-old girls with a giant abdominal swelling. Signs and symptoms differed between those two girls, as serum tumour markers showed different elevation patterns. Additional investigations including a CT scan and a MRI scan were performed and revealed masses originating from the ovary. Histopathological evaluation after cystectomy showed a mature teratoma and a mucinous cystadenoma.

BACKGROUND

Ovarian tumours are rare in childhood and account for approximately 1% of all tumours in children and adolescents.[1] Germ cell tumours are the most common type of ovarian tumours in children and adolescents.[1–4] Epithelial cell tumours are less likely in children,[4] while mature teratomas, commonly called dermoid cysts,[5] are the most frequently occurring germ cell tumour of the ovary.[2 3] Immature teratomas and malignant germ cell tumours on the other hand, are relatively rare.[3]

CASE PRESENTATION

Case 1: a 15-year-old girl with a 6 months history of abdominal complaints was referred to our paediatric outpatient clinic. She had nausea, abdominal distension, amenorrhea and abdominal pain, which was characterised as severe, intermittent and mainly localised in both flanks. Physical activities like horse riding or running worsened her complaints and her nausea was intermittent in nature. The last menstruation was 3 months ago. Before this, her menstrual cycle was regular with dysmenorrhea. She attained menarche at the age of 13 years. She was not known to be sexually active. Furthermore, there was no history of fever or weight loss.

Physical examination of the abdomen at the time of the initial evaluation in the outpatient clinic revealed a massive abdominal distension without any palpable tenderness. Other clinical findings included minimal bowel sounds, a palpable mass which was not well defined and with a fundal height of 26 cm, and a dullness at palpation of the surface of the mass. There was no enlarged liver or spleen.

Case 2: the second case is about a 15-year-old healthy teenage girl who presented with a 4-week history of painless progressive abdominal distension. There were no nausea, vomiting or pyrosis, and her defecation and micturition pattern were normal. She attained menarche at the age of 13 years, and her menstrual cycle was described as very irregular. There was no reported use of oral contraceptives and she was not known to be sexually active.

On physical examination, an obvious swelling in the right lower quadrant of the abdomen was observed, which extended from the pelvic region up to her umbilicus, and crossed the midline to the left side of the abdomen. A smooth and firm mass was palpable, with a diameter of 8×10 cm.

INVESTIGATIONS

Case 1: abdominal ultrasound was performed and showed that the upper margin of the mass was at the level of the xiphoid process. Additional investigations were conducted including a CT scan of the abdomen. This revealed an intra-abdominal cystic mass with a size of 17×11×22.5 cm, which contained solid components and several calcifications (figures 1 and 2). The differential diagnosis at this stage included an ovarian cyst, germ cell tumour, sex cord-stromal tumour, adenoma or an adenocarcinoma.

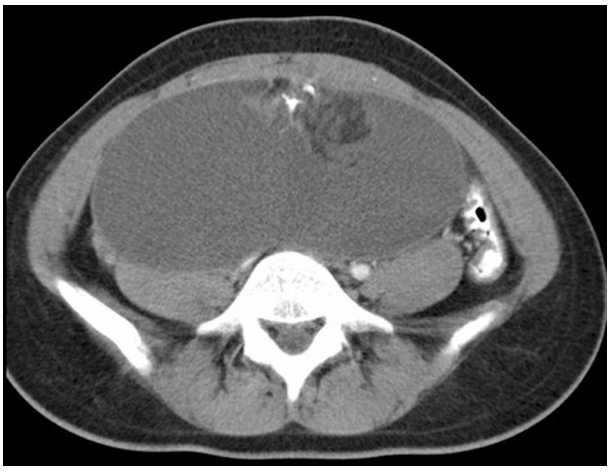

Figure 1 CT image of the mature teratoma in case 1, showing a very well-defined large cystic tumour of the right ovary with internal calcification, occupying almost the entire abdominal cavity.

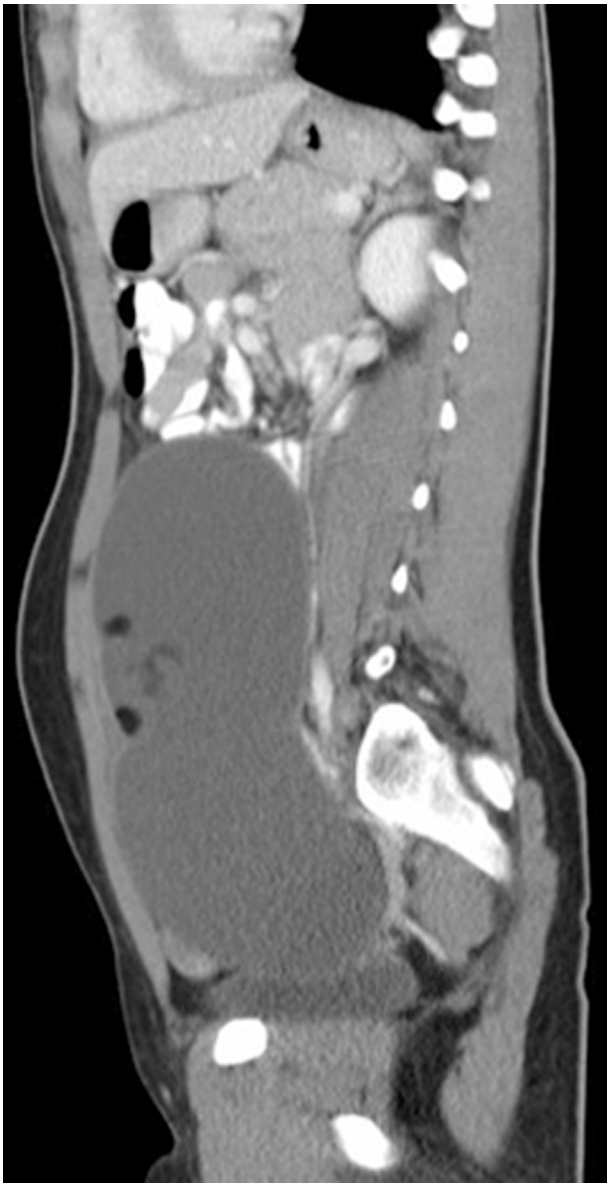

Figure 2 Sagittal view of the mature teratoma in case 1, showing the maximum cranio-caudal size of the tumour.

Routine laboratory tests were conducted and revealed normal haematological and blood chemistry values. Additional tests for tumour markers (α-fetoprotein (AFP) 2.8 kU/l, total lactate dehydrogenase (LDH) 314 U/l, β human chorionic gonadotropin (β-HCG) <1 U/l) were normal. A pregnancy test was also performed which was negative.

Case 2: evaluation of the mass by ultrasound revealed a multi-cystic process with an approximate diameter of 15×9 cm, emerging from the pelvis. However, the exact origin of the mass was difficult to determine and there was no evident sign of other organ involvement. Multiple gas-fluid levels were observed within the mass. In order to clearly define its structure, an abdominal MRI scan of the mass was ordered. This showed a well-defined multi-cystic tumour arising from the right ovary with a maximum cranio-caudal size of 17.5 cm (figure 3). The swelling that almost filled the entire abdominal cavity did not contain any solid masses. There were also no signs of local tumour infiltration or metastasis. T1 sequence with adipose tissue suppression revealed a varying signal intensity of the different cystic compartments, probably due to a different fluid level. At this stage there was a high suspicion of a serous cystadenoma or a cyst adenocarcinoma of the right ovary. Again, routine laboratory test revealed normal haematological and blood chemistry values. Values of tumour markers also were within there normal range (cancer antigen (CA)-125.15 kU/l, AFP 2.2 kU/l, β-HCG 0.1 U/l, total LDH 142 U/l).

Table 1 Ovarian tumour marker expression

Germ cell tumours	
Teratomas	
Mature	AFP
Immature	AFP, CA-125
Malignant	AFP, β-HCG
Choriocarcinoma	β-HCG
Embryonal carcinoma	β-HCG, AFP
Dysgerminomas	LDH, β-HCG, CA-125
Endodermal sinus tumours (yolk sac carcinomas)	AFP
Mixed germ cell tumours	AFP, β-HCG, CA-125
Epithelial tumours	
Serous and mucinous cystadenomas/ cystaden carcinomas	CA-125
Sex-cord stromal tumours	
Granulosa-thecal cell/Sertoli–Leydig cell	Serum testosterone metabolites, oestradiol, AFP, inhibin

AFP, α-fetoprotein; β-HCG, β human chorionic gonadotropin; CA, cancer antigen; LDH, lactate dehydrogenase.

OUTCOME AND FOLLOW-UP

Case 1: based on the findings from both the laboratory and imaging studies the likelihood for an ovarian mass was high. The patient was referred to a tertiary centre for further gynaecological evaluation after which she later underwent an explorative laparotomy. The patient was ultimately found to have an extremely large mature teratoma (30 cm) of the right ovary. A right oophorectomy was performed, and ongoing follow-up examinations were normal.

Case 2: the teenage girl was referred to a tertiary centre, where she underwent a right ovarian cystectomy. The final pathological analysis confirmed a benign mucinous cystadenoma of the ovary. The girl made an uneventful recovery, and follow-up examinations showed no recurrence so far.

DISCUSSION

The incidence of combined benign and malignant ovarian tumours has been estimated to be around 2.6 cases per 100 000 in girls younger than 15 years of age.[6 7] Primary ovarian neoplasms are divided in epithelial and non-epithelial tumours (table 1). The non-epithelial tumours can originate from the germ cells, sex-cord stroma or mesenchymal structures. In the non-epithelial tumours germ cell tumours predominate and may be further subdivided based on the differentiation of the malignant cells.[7–11] Epithelial tumours and sex cord-stromal tumours each account for about 15% of paediatric ovarian masses,[7 8] but are rarely seen before menarche.[12–15] It is important to correctly diagnose the histologic type of these rare tumours for proper staging and

BMJ Case Reports 2012; doi:10.1136/bcr.11.2011.5143

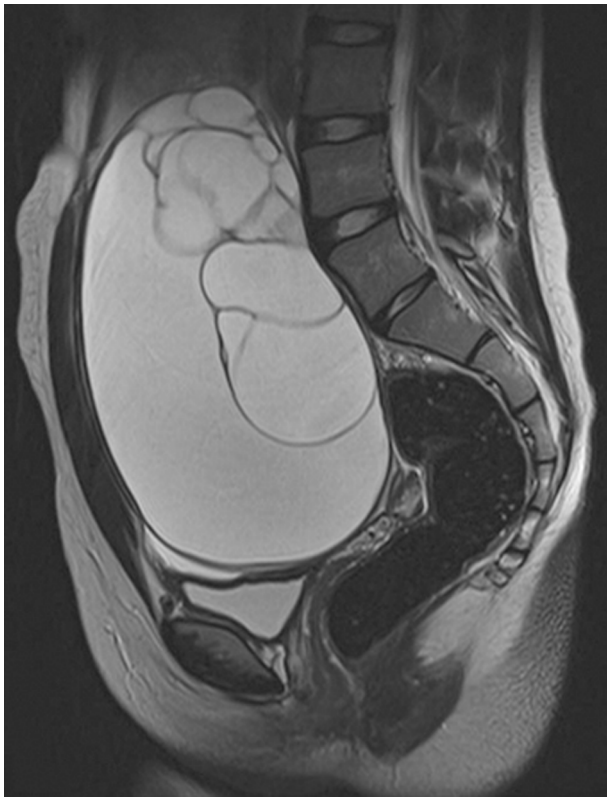

Figure 3 T2 weighted MRI image in case 2, showing an abdominal mass that almost fills the entire lower abdomen and containing multiple cystic areas that are typically seen in mucinous cystadenomas.

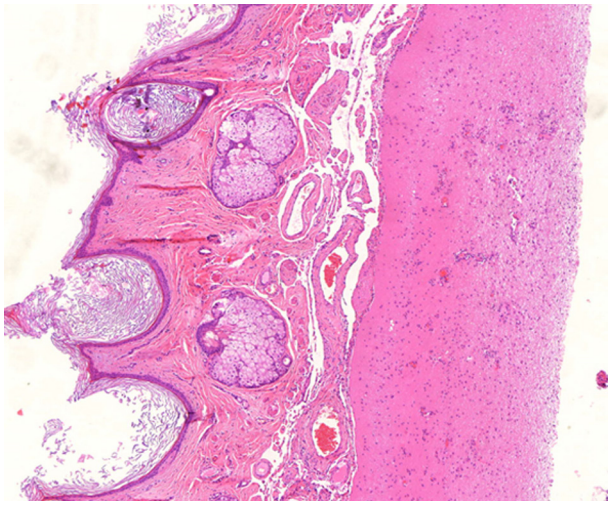

Figure 4 Histology of the mature ovarian teratoma in case 1, showing multiple follicular ovarian cysts. One cyst was lined by stratified squamous epithelium. Under the surface epithelium layer diffuse fibromatous stroma appears with the presence of several sebaceous glands and hair follicles. The image also shows well-differentiated neural tissue. There is no evidence of immature or malignant tissue.

treatment since it involves young girls, who want to preserve fertility.[7]

In order to illustrate the importance of this, the histological subtype of the ovarian mass reported in case 1 is presented in figure 4.

Teratomas are germ cell tumours containing tissue from all three germ cell layers. These neoplasms are classified in: mature teratomas, consisting of well-differentiated tissue; immature teratomas, showing malignant transformation to a non-germ cell tumour such as squamous cell carcinoma.[16 17] Most are mature cystic teratomas with predominantly ectodermal derivatives such as hair and teeth,[2] but also cartilage or bone, neural and thyroid tissue can be found.[18] Immature tumours are graded from I to III based on the amount of immature neuroepithelium or other immature elements of the mass.[7] The rate of recurrence for ovarian germ cell tumours varies among studies from 4.5 to 30% and it seems that immature elements are more frequently at risk of relapse.[2 3 5 7 16 19] Most of the recurrences are local, but can be distant.[16] Overall survival for ovarian germ cell tumours including teratomas is between 97 and 100%.[3] A case series from an institution in Turkey evaluated 501 cases of mature cystic teratomas of the ovary and reported a median tumour diameter of 7.0±4.5 cm.[18] This finding indicates that the mature teratoma reported in our first case was exceptionally large (30 cm).

The histologic subtypes of epithelial ovarian tumours in children include only serous and mucinous tumours, and are more commonly serous than mucinous.[12 13] The histopathology of mucinous tumours shows: mucinous cystadenoma, mucinous tumour of uncertain malignant potential (borderline) and mucinous carcinoma.[6 13] Borderline epithelial ovarian tumours are defined as epithelial neoplasms of varying levels of nuclear atypia, which lack stromal invasion of the ovary.[12] In a study of nineteen epithelial-derived ovarian tumours in children the mean age at diagnosis was 13.9 years±4 years. Mucinous cystadenoma as seen in case 2 is a benign cystic ovarian neoplasm, and is rarely found in children, especially before menarche. Incidence rates for mucinous cystadenomas are unknown and only a few case reports have been published in the literature.[6 13–15] Mucinous cystadenomas appear as large cystic masses and are often multi-loculated, containing sticky gelatinous fluid. Microscopically the tumour consists of cystic spaces lined by tall columnar epithelium with mucinous differentiation.[6 13] In general, ovarian mucinous cystadenomas tend to present with abdominal distension.

Ovarian masses include neoplastic and non-neoplastic processes. Non-neoplastic conditions include follicular cysts, corpus luteal cysts and endometriomas. A pregnancy test also may be indicated in girls with an abdominal mass at the reproductive age. The differential diagnosis of intra-abdominal tumours of non-gynaecological origin includes Wilm's tumour, neuroblastoma, leukemia, lymphoma, hepatic tumours and soft tissue sarcomas. The age of the child helps in the differential diagnosis.

Ovarian masses often present with abdominal complaints that can mimic other diseases, in particular, appendicitis. In some particular case series, upto 38 per cent of patients seen in the emergency room had a preliminary diagnosis of appendicitis. A study about misdiagnoses of ovarian masses in children and adolescent describes gastrointestinal symptoms, such as nausea and vomiting, could result in other presumptive diagnoses including gastroenteritis, constipation, urinary tract infection

and non-specific abdominal pain.[20] The most common complaints with ovarian masses are abdominal pain (73–78%).[10 11 20–22] A long history of intermittent pain followed by a more persistent severe ache leading to surgery is not unusual.[17]

On physical examination, 25–69% of girls have abdominal tenderness,[20 21] and 29% have a palpable mass.[10 20 22] Abdominal distension and precocious puberty are other signs that could be found on physical examination. The elevated β-HCG levels in patients with embryonal carcinoma and choriocarcinoma can cause precocious puberty.[17] In a retrospective analysis of ovarian epithelial tumours 21% of all children had ascites.[12] Ovarian tumours that undergo torsion can mimic acute appendicitis and may lead to emergency surgery. Torsion has been considered as the most common complication associated with mature teratomas.[18]

A gynaecological examination using ultrasound is compulsory.[1 21] Ultrasound is very accurate in diagnosis of ovarian pathology, but it can hardly distinguish between benign and malignant tumours.[4] CT or MRI can add information about the extent and ingredients of the tumour (eg, fat).[1 21] An evaluation of the hormonal status of the patient together with a search for any elevated tumour markers, such as AFP, β-HCG, LDH and CA-125, should be considered.[5 21] Tumour markers, particularly AFP, are important indicators in the management, prognosis and follow-up of germ cell tumours. CA-125 levels on the other hand, are often elevated in cases of epithelial cell tumours.[3 6 12] Table 1 gives an overview of tumour marker expression in ovarian tumours. AFP may be elevated in patients with teratomas and is invariably elevated in those with yolk sac tumours.[7] Serum AFP levels are usually elevated in patients with embryonal carcinoma and endodermal sinus tumour, while β-HCG levels are elevated in patients with embryonal and choriocarcinoma.[1 17] Dysgerminomas may present with positive β-HCG, a marker associated with choriocarcinoma, CA-125, or LDH.[1 7] Patients with juvenile granulosa cell tumours frequently have elevated oestradiol and testosterone levels as well as an increased AFP and inhibin.[23]

Therapy for obviously benign ovarian tumours in children consists of cystectomy to preserve both ovaries.[14] Ovarian surgery during childhood and adolescence can compromise future fertility, due to removal of normal ovarian tissue or due to adhesion formation.[1] Therefore, conservative ovarian surgery in childhood and adolescence should be planned carefully, and laparoscopic approach is preferable.[2 3] In those cases that a malignancy is likely (eg, increase of specific tumour markers) the surgery is preferably performed via laparotomy because of both suspicion of malignancy and the size of the mass. This is because of concerns regarding spillage of malignant tumour contents when a procedure is done laparoscopically, and because proper staging at the time of surgery plays an important role in determining the need for postoperative chemotherapy.[7 24]

Although ovarian tumours are rare in children, they should be considered in the differential diagnosis when a girl presents with abdominal symptoms and a mass.[17] Ovary and fertility sparing surgery should be performed, unless there is a suspicion of a malignancy.

Learning points

- Germ cell tumours are the most common type of ovarian tumours in children and adolescents.
- Ovarian masses often present with abdominal complaints that can mimic other diseases.
- Ultrasound investigation together with evaluation of hormonal status and tumour markers is compulsory in diagnosing the origin of ovarian masses.
- Conservative ovarian surgery is important to preserve fertility.

Competing interests None.

Patient consent Obtained.

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