

# Hydrothorax, ascites and an abdominal mass: not always signs of a malignancy - Three cases of Meigs' syndrome

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## ABSTRACT

This case report presents three cases of Meigs' syndrome: a benign ovarian tumor with ascites and a hydrothorax. After removal of the ovarian tumor, the symptoms resolved and the patients became asymptomatic. In daily practice, Meigs' syndrome is at first sight often mistaken for ovarian cancer. With this case report we would like to emphasize that the clinical presentation of an ovarian tumor might be ovarian cancer, but can masquerade as something uncommon like Meigs' syndrome. In a time span of two years we encountered three cases.

## CASE REPORT

### CASE REPORT

#### Case 1

A 63-year old cachectic Caucasian postmenopausal woman had complaints of persistent coughing and dyspnea, despite antibiotic treatment, and a palpable solid pelvic mass. She had a 7.5-pack year history of smoking. A chest x-ray showed pleural effusion on the right side (figure 1). Three liters of pleural fluid, without malignant cells, were drained. Ultrasound imaging showed an irregular solid tumor behind the uterus in the pouch of Douglas, of 13.5x11x7.5cm. A pocket of ascites of 4x7cm was measured in the pouch of Douglas. As in accordance to the Dutch National Guidelines, a computed tomography (CT)-scan of the abdomen and thorax was performed after drainage of the pleural fluid. It confirmed an inhomogeneous pelvic mass of 11.0x7.8x21.3cm diameter originating from either the ovaries or uterus, ascites without lymphadenopathy (figure 2). CA125 level was 625kU/ml (normal range <35kU/ml). At laparotomy an uncomplicated total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH-BSO) was performed. Histological examination revealed a benign fibroma of the right ovary of 15x11x7cm in diameter (figure 3). Postoperatively the patient recovered uneventful and the ascites and hydrothorax resolved. Since Meigs' syndrome is a benign disease, the patient was discharged from further specialist care.

#### Case 2

A 62-year old obese Caucasian postmenopausal woman was admitted with massive ascites, a large solid, mobile abdominal mass, pleural effusion and edema of the lower extremities. The ultrasound showed a large mobile smooth and solid tumor, possibly originating from the right ovary. A normal left ovary was observed, together with massive ascites in the pouch of Douglas. CA-125 level was 520kU/ml. She had a 10-pack year history of smoking. The CT-scan of the abdomen and thorax showed massive ascites, a 23.2x9.8x14cm large abdominal mass and pleural effusion mainly on the right side (and a small pneumothorax left without known cause) (figure 4). Chest drains were placed on both sides to drain the massive hydrothorax and treat the pneumothorax. Twenty liters of ascites was removed by drainage of the abdominal cavity. Cytology of the ascites did not reveal any malignant cells, which aroused the suspicion of Meigs' syndrome. After stabilization of the hydrothorax, an uncomplicated TAH-BSO was performed. Furthermore, a large solid mass appearing as a fibroma of the right ovary was found (figure 5). Histological examination confirmed a benign fibroma of the right ovary of 30x16x12cm weighing 1413 grams (figure 6). The postoperative period was uneventful and all signs and symptoms disappeared within one month. The patient was discharged from further specialist care.

### Case 3

A 62-year old obese Caucasian postmenopausal woman with a growing abdominal mass and edema of the lower extremities was seen in our emergency department. Her medical history included an appendectomy and an ovarian cystectomy of a mature teratoma (unknown side). She had a 40-pack year history of smoking. During physical examination a large immobile solid abdominal mass was palpated. With vaginal and abdominal ultrasound imaging a smooth multilocular-solid tumor with a largest diameter of 11x11x11cm was seen above the uterus on the right side. Behind the uterus, in the pouch of Douglas, a smooth solid tumor with a largest diameter of 14x11x8cm was seen. After the ultrasound, a CT-scan of the abdomen and thorax was performed which revealed a large multi-cystic mass of 8.8x14.5x14.1cm in the right lower abdominal quadrant and a solitary cyst of 13.2x9.8x11.8cm in the pelvic cavity. A unilocular cyst of 4.9x3.1x3.3cm was found originating from the left ovary. There was no ascites and only a mild right-sided pleural effusion was seen (figure 7, 8 and 9). The CA-125 level was 252kU/ml. Several days after the first admission, the patient developed complaints of increasing dyspnea. It was found to be most likely due to increased pleural effusion. An emergency chest x-ray was made which confirmed the suspicion of massive pleural effusion and a right-sided pneumothorax without known cause (figure 10). Cytology of the pleural effusion did not show any malignant cells. Chest drains were placed and a laparotomy was planned. After stabilization of the patient, an uncomplicated TAH-BSO and infracolic omentectomy was performed. An enlarged right ovary of approximately 15x16x7cm was seen and removed (figure 11). Histological examination revealed a borderline mucinous tumor (figure 12). A simple cyst of the left ovary was removed, and found to be benign on histopathological analysis. After lifting up the normal appearing uterus, another mass of approximately 15cm was found in the pouch of Douglas. It was solitary and did not have any connection to the uterus or the ovaries. Histological examination revealed a mature teratoma, without ovarian tissue (figure 13). After excision of all masses, all patients' complaints disappeared. Because borderline ovarian tumors can have very late recurrences our patient came for regular and intensive follow-up visits to our outpatient clinic. After three uneventful years she died at home of a myocardial infarction.

## DISCUSSION

### Etiology & Demographics:

Meigs' syndrome is a triad of a benign ovarian tumor, pleural effusion, and ascites. The combination with marked elevated CA-125 is a rare clinical entity. Although elevated serum CA-125 in postmenopausal women with a solid adnexal mass is highly suspicious of a malignant ovarian tumor, a benign disease like Meigs' syndrome can't be excluded. [1] The pathophysiology of ascites and hydrothorax in Meigs' syndrome have not been elucidated yet. Proposed mechanisms are direct pressure on lymphatic vessels or blood vessels, hormonal stimulation, torsion of a tumor and hypersecretion of vascular endothelial growth factor (VEGF)[2,3]. The mechanism that causes elevation of CA-125 is not known. One

hypothesis is that this might be due to mesothelial expression of CA-125 biochemical factors. Other possible factors for an increase in CA-125 might be peritoneal mechanical irritation from raised intraperitoneal pressure [4]. Liou et al. 2011 report that the expression level of CA-125 correlates with the ascites volume in patients with Meigs' syndrome.[5]

However, we cannot confirm this hypothesis based on our three presented cases. Although a correlation between hydrothorax and levels of CA125 has not been described in the literature to date, our case reports suggest a possible trend.

Case 1 had a CA-125 level of 625 kU/ml, and drainage of three liters of pleural fluid. Case 2 showed a CA-125 level of 520 kU/ml, with a massive hydrothorax. At last, case 3 had a CA-125 level of 252 kU/ml and showed only mild right-sided hydrothorax. After two days the last patient was admitted to the hospital due to increased dyspnea, probably due to increased pleural effusion. At that time, unfortunately, no new blood sample for the estimation of CA-125 level was taken.

We could not find any correlation between the levels of CA-125 and tumor size. It is unclear whether there is a relationship between smoking and Meigs' syndrome. One case-control study shows that there is no significant association between Meigs' syndrome and smoking.[6] In a large epidemiological study (n=28114 women with ovarian cancer and n=94942 without ovarian cancer) the relationship between smoking and ovarian cancer was studied. The overall ovarian cancer incidence was only slightly increased in current smokers compared with women who had never smoked (RR 1.06, 95% CI 1.01-1.11, p=0.01).[7]

Although the precise epidemiology of Meigs' syndrome is unknown, it is estimated that it accounts for about 1% of all ovarian tumors.[8] The clinical presentation of postmenopausal women with adnexal masses, ascites and a hydrothorax is highly suspicious for malignant ovarian cancer. However Meigs' syndrome, as it presents with the same symptoms, should be ruled out.

### Clinical & Imaging findings:

Although the diagnosis of Meigs' syndrome can't be made solely based on imaging, the suspicion can be raised by the clinical presentation (dyspnea, growing abdominal mass, lower-extremity edema, etc.). On physical examination, a solid mobile structure may be palpated in the abdomen together with abdominal ascites. Dullness to percussion of the lungs may be observed due to the pleural effusion together with a pleural rub during auscultation. As in our cases, an ultrasound of the upper and lower abdomen should be made, since the mass may be large and can extend into the upper abdomen. Pelvic (vaginal) ultrasound shows a well-demarcated adnexal mass without increased vascularity. To distinguish between benign and malignant tumors of the ovary, the IOTA (International Ovarian Tumour Analysis) simple rules can be applied (www.iotagroup.org). This is a preoperative classification system for ovarian tumors, consisting of five features for benign tumors (B-features) and five features typical for malignant tumors (M-features) as shown in figure 14. The B-features are: unilocular cyst, presence of solid components

with largest diameter <7mm, presence of acoustic shadows, smooth multilocular tumor with largest diameter <100mm, no blood flow (color score 1). M-features are: irregular solid tumor, presence of ascites, at least 4 papillary structures, irregular multilocular-solid tumor with largest diameter >100mm and very strong blood flow (color score 4). In case only B-features apply the cyst is classified as benign. If only M-features apply, a malignancy is suspected. If no features apply, or both B- and M-features apply, the cyst is classified inconclusive.[9] The sensitivity, specificity, and positive-predictive values for all primary ovarian and tubal cancers were 84.9%, 98.2%, and 5.3% for ultrasound not based on the IOTA rules.[10]

Next to an abdominal mass, ascites may be present and seen with an ultrasound examination. Fibromas can display a wide variety of sonographic features. In accordance to the Dutch National Oncology Guidelines, a CT-scan of the abdomen and thorax is made in case of a suspicious pelvic mass to exclude local and distant metastases and lymphadenopathy. Despite all imaging techniques, only the histological examination of the removed tumor can confirm the diagnosis of Meigs' syndrome.

#### Treatment & Prognosis:

Although Meigs' syndrome may mimic a malignant condition, it is a benign disease and has a very good prognosis if properly managed. Life expectancy of patients with Meigs' syndrome mirrors that of the general population after surgery, and less than 1% of fibromas progress to fibrosarcoma. After resection of the ovarian tumor, the symptoms will resolve and the patient will become asymptomatic. In all three presented patients we performed a TAH-BSO, which is the primary treatment for Meigs' syndrome, and all three patients were asymptomatic after this surgical intervention.

#### Differential Diagnosis:

Conditions to be included in the differential diagnosis are: ovarian cancer, other cancers including bowel and lung cancer, liver cirrhosis, tuberculosis, congestive heart failure, and nephrotic syndrome. All differential diagnosis described above, except for bowel cancer, do not always present with an abdominal mass, but they can cause ascites and/or pleural effusion. Both the ascites and/or pleural effusion can be seen with ultrasound, CT-scan and MRI.

Imaging modalities such as ultrasound, CT-scan and MRI can help to clarify the nature of these problems in a diversity of possibilities. To distinguish between benign and malignant tumors of the ovary on ultrasound, the IOTA simple rules can be applied ([www.iotagroup.org](http://www.iotagroup.org)) as described above. In bowel or lung cancer, the malignant mass is most likely not located in the ovary, which most likely will be shown by CT-scan or MRI.

In bowel cancer, a CT-scan is commonly used to measure the size of the tumor, and to assess nodes and metastases, with an accuracy between 45-77%. Complications such as fistulae, obstruction, intussusception and perforation may also be visualized with CT-scan.[11] An MRI can also be used to measure the size of the tumor, and has a staging accuracy of

73% and a sensitivity of 40% for lymph node metastases.[12] Abdominal ultrasound has a high sensitivity of 79% and specificity of 92% in the diagnosis of colon cancer. Sonographic findings such as an irregular and hypoechoic thickening of the colon wall and an irregular contour, as well as the loss of stratification in certain layers of the wall, can suggest the diagnosis of bowel cancer.[13] A PET-scan is not regularly used in patients with primary colorectal cancer, but can be used to detect extra hepatic metastases.[14]

For lung cancer, conventional radiography is not specific in finding early disease due to visibility. The CT-scan, MRI and PET play an important role in the pretreatment clinical staging. A peripheral mass or suspicious lung nodule can be shown, together with pleural effusion, chest wall involvement and lymphadenopathy. The sensitivity and specificity differ between the different types of lung cancer (small cell, non-small cell etc).

In the case of liver cirrhosis imaging is not reliable enough to differentiate between the various underlying etiologies. Ultrasound is the major screening tool for cirrhosis, and appearances include: surface nodularity (88% sensitive, 82-95% specific), overall coarse and heterogeneous echotexture, segmental hypertrophy/atrophy, signs of portal hypertension, splenomegaly, ascites and fatty changes.[4,15] A CT-scan is insensitive in early cirrhosis, most established findings include surface and parenchymal nodularity, fatty changes, segmental hypertrophy/atrophy, parenchymal heterogeneity, isodense /hyperdense regenerative nodules and predominantly portal venous supply to dysplastic nodules. MRI is also insensitive to diagnose early cirrhosis, but has a significant role in screening cirrhotic livers due to the detection of morphologic changes and regenerative nodules.[16] A PET-scan is not used as a diagnostic tool for liver cirrhosis.

The diagnosis of nephrotic syndrome is based on diagnostic criteria: proteinuria >3.3-5 g/24 hour or protein:creatinine ratio of >300-350mg/mmol, serum albumin <25g/l, clinical evidence of peripheral edema and sometimes severe hyperlipidemia (total cholesterol often >10mmol/l). Ultrasound is only used to assess the renal size and morphology or whenever there are signs of renal vein thrombosis.[17] Other imaging modalities are generally not used as a diagnostic tool for nephrotic syndrome.

Abdominal tuberculosis can present with ascites, peritoneal thickening and omental nodes due to an infection of abdominal organs with *Mycobacterium tuberculosis*. [18] Abdominal ultrasound is nonspecific and may show caecal wall thickening and lymphadenopathy.[19] It may also be helpful to detect pleural effusion and/or ascites.[20] A CT-scan may show circumferential wall thickening of the terminal ileum and caecum, asymmetric thickening of the ileocaecal valve, mesenteric lymphadenopathy and involvement of other organs (such as lungs).[18] CT-scan depicts lymphadenopathy, bronchogenic spread, and abdominal tuberculosis. A MRI might be used to diagnose tuberculous spondylitis, but is not an appropriate diagnostic tool for abdominal tuberculosis.[21]

Congestive heart failure is a clinical syndrome caused by structural and functional defects in the myocardium, which results in the impairment of ventricular filling or ejection of blood. Blood tests (such as complete blood count, urinalysis, metabolic profile, electrolytes, lipid profile and brain natriuretic peptide (BNP) and N-terminal proBNP (NT-proBNP) can be taken. Also CA-125 levels can be elevated in heart failure patients.[22] With a transthoracic echocardiography (TTE) a disturbed ventricular function, size, wall thickness, wall motion and/or valve function can be seen. And an MRI provides high anatomical resolution of the heart and surrounding structures, which may elucidate a congenital heart disease causing heart failure. A cardiac CT-scan can also assess cardiac structures, function and coronary arteries.[23] A PET-scan is generally not used to detect congestive heart failure.

#### TEACHING POINT

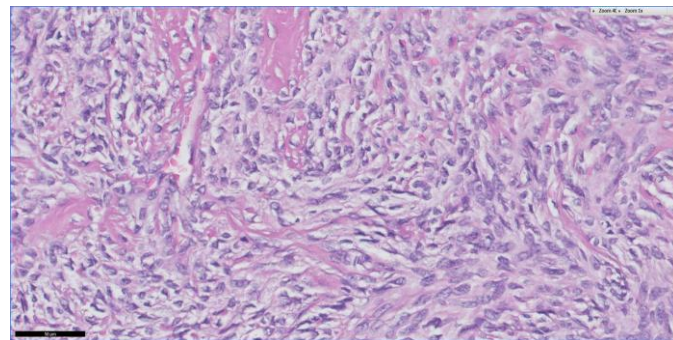
Clinical presentation of postmenopausal women with solid adnexal masses, ascites, and hydrothorax is highly suspicious for malignant ovarian cancer. However, Meigs' syndrome should be ruled out as it can present with the exact same symptoms.

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FIGURES



**Figure 3:** Case 1: A 63 year old postmenopausal female with Meigs' syndrome.

A pathological specimen, hematoxylin & eosin staining, 10x magnification. Stromal proliferation of cells are seen without atypical nuclei. Edema and fibrosis is seen, with collagen deposition. In conclusion, this is a fibroma of the right ovary, with a diameter of 15cm. No malignancy.

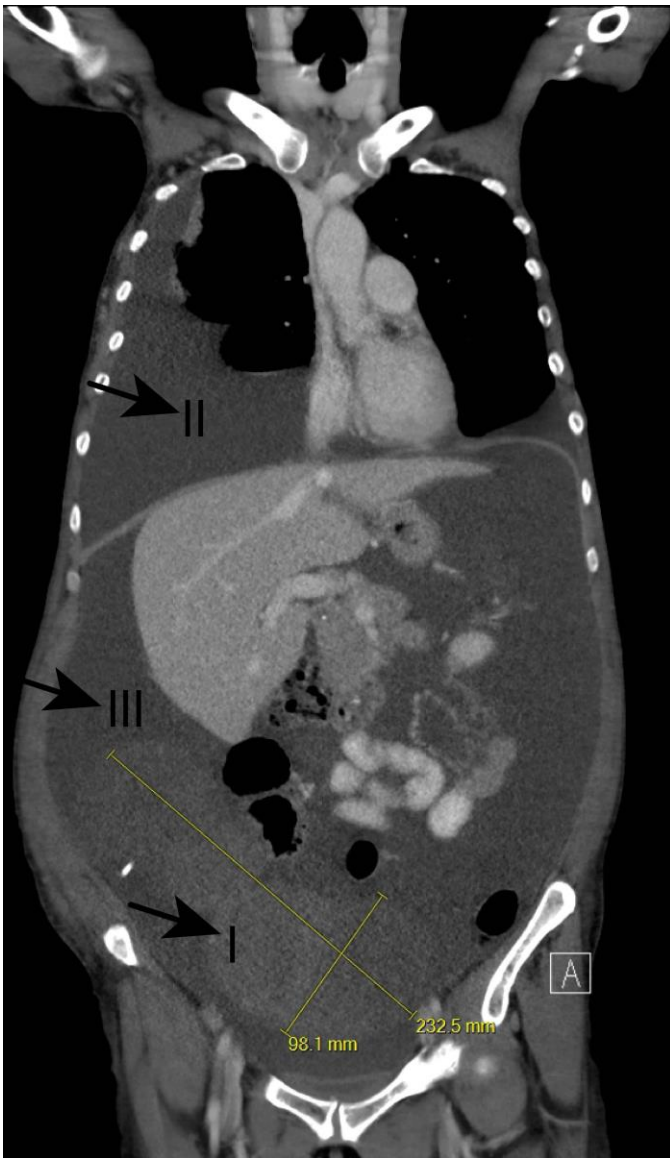
**Figure 1:** Case 1: A 63 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** Massive pleural effusion on the right side. No signs of congestive heart failure. **TECHNIQUE:** A PA view of a chest x-ray, Canon Inc. CSCI 1mAs.



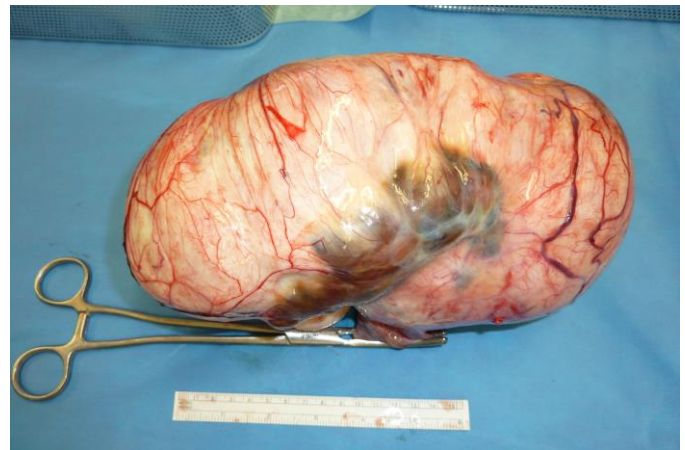
**Figure 2 (left):** Case 1: A 63 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** An inhomogeneous mass in the supero lateral region of the uterus. This mass is 11.0x7.8cm, and originates from the uterus or ovaries (I). No nodular lesions in the lungs, no lymphadenopathy. Homogeneous aspect of the liver. No axillary or mediastinal lymphadenopathy. Intra-abdominal fluids with collections around the liver, kidneys, bladder and pouch of Douglas (II). **TECHNIQUE:** A coronal image of a CT-scan SOMATOM Definition Flash 2x128 slice. Contrast material was Visipaque 320 (100mL). Detector pitch 0.6, 120kV, 218 mAs, slice thickness 5.0mm.



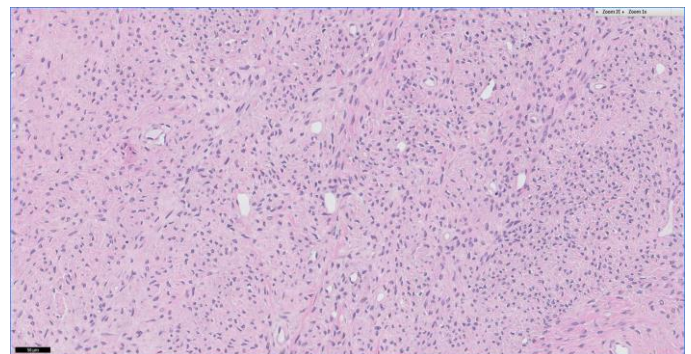
**Figure 4:** Case 2: A 62 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** Normal dimension of the heart and large vessels. An inhomogeneous and not sharp defined mass cranial to the uterus of 9.8x23.2cm (I). Massive pleural effusion (II) on the right side with atelectasis. No nodules intrapulmonary. Massive ascites (III). Normal aspect of the liver, spleen and pancreas. No lymphadenopathy. **TECHNIQUE:** A coronal image of a CT-scan SOMATOM Definition Flash 2x128 slice. Contrast material was Visipaque 320 (100mL). Detector pitch 0.6, 100kV, 215 mAs, slice thickness 5.0mm.



**Figure 5:** Case 2: A 62 year old postmenopausal female with Meigs' syndrome.

A photograph of the large fibroma that was removed during an uncomplicated surgical procedure. The pathology report revealed that the tumor was 30x16x12cm and 1413grams.



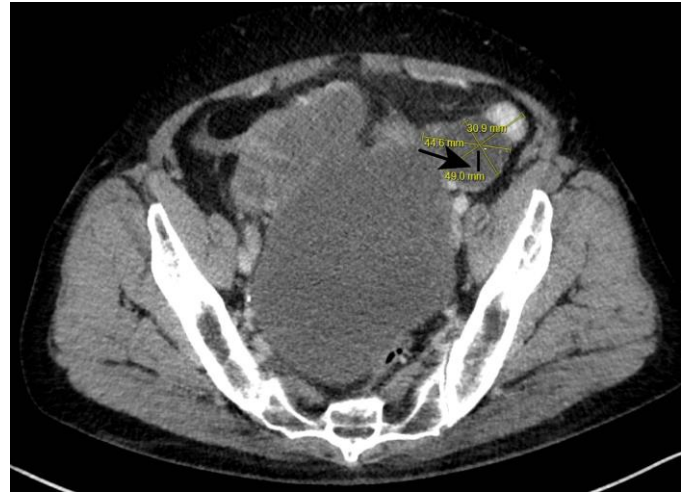
**Figure 6:** Case 2: A 62 year old postmenopausal female with Meigs' syndrome.

A pathological specimen, hematoxylin & eosin staining, 10x magnification. The cysts consisted of alternating cell rich regions with extended edema. The cyst wall consisted of fibrinoid necrotic stromal cells with abundant macrophages. No atypical cells were observed. In conclusion, this is a fibroma of the right ovary, with a diameter of 30x16x12cm, 1413grams. No malignancy.



**Figure 7:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** A multicystic tumor in the pelvic cavity and right lower abdomen of 8.8x14.5cm (I). No ascites in the pouch of Douglas. **TECHNIQUE:** A transverse image of a CT-scan SOMATOM Definition Flash 2x128 slice. Contrast material was Visipaque 320 (100mL). Detector pitch 0.6, 100kV, 310 mAs, slice thickness 3.0mm.



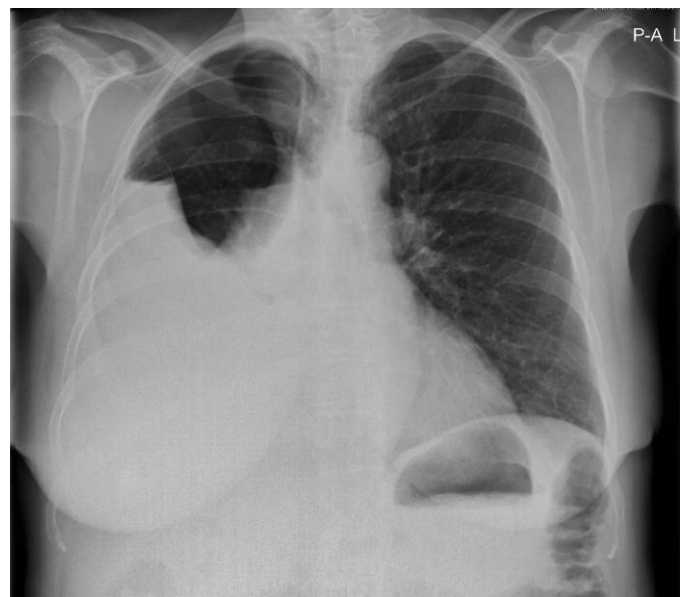
**Figure 9:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** A small unilocular cyst of 4.9x3.1cm in the left ovary (I). No ascites described in the pouch of Douglas. **TECHNIQUE:** A transverse image of a CT-scan SOMATOM Definition Flash 2x128 slice. Contrast material was Visipaque 320 (100mL). Detector pitch 0.6, 100kV, 310 mAs, slice thickness 3.0mm.



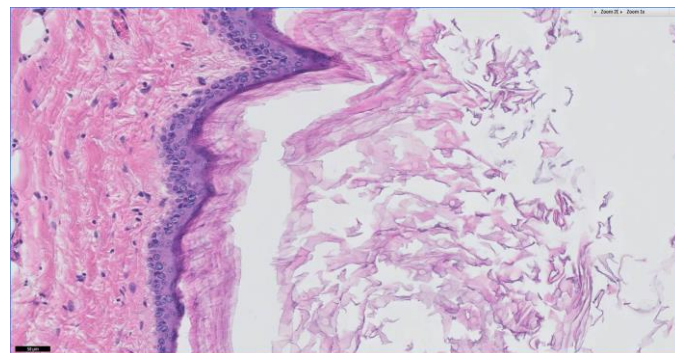
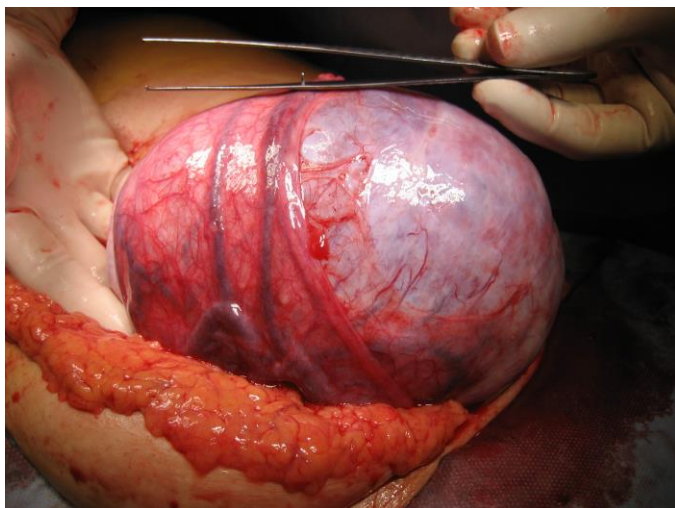
**Figure 8:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** A large solitary cyst of 13.2x9.8cm in the pelvic cavity (I). No ascites in the pouch of Douglas. **TECHNIQUE:** A transverse image of a CT-scan SOMATOM Definition Flash 2x128 slice. Contrast material was Visipaque 320 (100mL). Detector pitch 0.6, 100kV, 310 mAs, slice thickness 3.0mm.



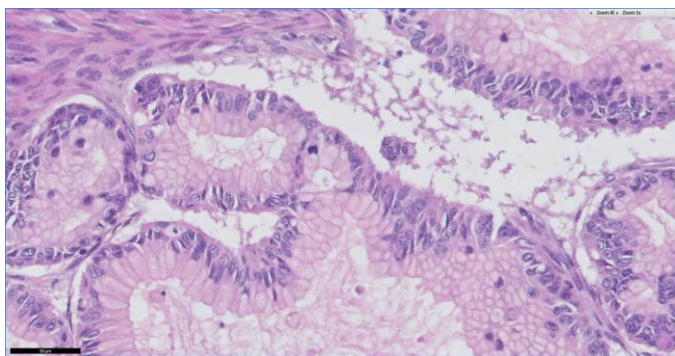
**Figure 10:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome.

**FINDINGS:** Massive pleural effusion on the right side, with a pneumothorax. No mediastinal shift. **TECHNIQUE:** A PA view of a chest x-ray, Canon Inc. CSCI 1mAs.



**Figure 11:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome. A photograph of the enlarged right ovary of approximately 15 cm containing a borderline mucinous tumor.

**Figure 13:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome. A pathological specimen of the mature teratoma, hematoxylin & eosin staining, 10x magnification. The tumor ruptured before arrival to the pathologist. The cystic wall however, showed keratinizing squamous cells and a stratum granulosum. This confirmed a mature teratoma.



**Figure 12:** Case 3: A 62 year old postmenopausal female with Meigs' syndrome. A pathological specimen of the borderline mucinous tumor, hematoxylin & eosin staining, 10x magnification. Minimal cytonuclear atypic cells together with mitotic figures are seen. However, no atypical cell division is observed. In some areas of the tumor, there is a suspicion for micro-invasion. Additional staining with alcian blue, keratine 7 and 20, PAS, PAS-D and CDX-2 confirmed the diagnosis of a borderline mucinous tumor.

Benign features	Malignant features
Unilocular cyst	Irregular solid tumor
Presence of solid components with largest diameter <7mm	Ascites
Acoustic shadows	At least four papillary structures
Smooth multilocular tumor with largest diameter <10cm	Irregular multilocular solid tumor with largest diameter ≥10cm
No blood flow	Very strong blood flow

**Figure 14:** The ten features from the IOTA simple rules (www.iotagroup.org). These can be used to diagnose ovarian cancer in women who have at least one persistent adnexal tumor. Based on these features the tumors are classified as benign (B-features), malignant (M-features) or inconclusive.

<b>Etiology</b>	Unknown.
<b>Incidence</b>	Unknown, accounts for about 1% of ovarian tumors.
<b>Gender ratio</b>	Only in women.
<b>Age predilection</b>	Increase in the third decade and increases progressively in postmenopausal women, with an average of about 50 years.
<b>Risk factors</b>	Unknown
<b>Treatment</b>	Resection of ovarian tumor.
<b>Prognosis</b>	Very good prognosis if properly managed.
<b>Findings on imaging</b>	Pelvic ultrasound: well demarcated adnexal mass without increased vascularity. CT-scan abdomen and thorax: no metastases, ovarian tumor, pleural effusion and ascites.

**Table 1:** Summary table of Meigs' syndrome.



Entity	Ultrasound (US)	CT-scan	MRI	PET
<b>Meigs' syndrome</b>	<ul style="list-style-type: none"> <li>Well demarcated adnexal mass with benign features (unilocular, presence of solid components with largest diameter &lt;7mm, presences of acoustic shadows, smooth multilocular tumor with largest diameter &lt;100mm, no blood flow)</li> </ul>	<ul style="list-style-type: none"> <li>Pleural effusion</li> <li>Ascites</li> <li>Adnexal mass</li> <li>No metastatic spread</li> </ul>	<ul style="list-style-type: none"> <li>Pleural effusion</li> <li>Ascites</li> <li>Adnexal mass</li> <li>No metastatic spread</li> </ul>	<ul style="list-style-type: none"> <li>Pleural effusion</li> <li>Ascites</li> <li>Adnexal mass</li> <li>No metastatic spread</li> </ul>
<b>Malignant ovarian tumor</b>	<ul style="list-style-type: none"> <li>Adnexal mass with malignant features (irregular solid tumor, presence of ascites, at least 4 papillary structures, irregular multilocular-solid tumor with largest diameter &gt;100mm, increased blood flow)</li> </ul>	<ul style="list-style-type: none"> <li>Metastases</li> <li>Adnexal mass</li> <li>Ascites</li> <li>Pleural effusion</li> </ul>	<ul style="list-style-type: none"> <li>Metastases</li> <li>Adnexal mass</li> <li>Ascites</li> <li>Pleural effusion</li> </ul>	<ul style="list-style-type: none"> <li>Metastases</li> <li>Adnexal mass</li> <li>Ascites</li> <li>Pleural effusion</li> </ul>
<b>Bowel cancer</b>	<ul style="list-style-type: none"> <li>Tumor (irregular and hypoechoic thickening of bowel wall)</li> <li>Ascites</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Metastases</li> <li>Mass in bowel/lung</li> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Metastases</li> <li>Mass in bowel</li> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Metastases</li> <li>Mass in bowel</li> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>
<b>Lung cancer</b>	<ul style="list-style-type: none"> <li>Lymphadenopathy</li> <li>Ascites</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Peripheral mass</li> <li>Suspicious lung nodule</li> <li>Pleural effusion</li> <li>Lymphadenopathy</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Peripheral mass</li> <li>Suspicious lung nodule</li> <li>Pleural effusion</li> <li>Lymphadenopathy</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Peripheral mass</li> <li>Suspicious lung nodule</li> <li>Pleural effusion</li> <li>Lymphadenopathy</li> <li>No adnexal mass</li> </ul>
<b>Liver cirrhosis</b>	<ul style="list-style-type: none"> <li>Surface nodularity</li> <li>Overall coarse and heterogeneous echotexture</li> <li>Segmental and fatty change</li> <li>Ascites</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Surface and parenchymal nodularity</li> <li>Fatty change</li> <li>Segmental hypertrophy/atrophy</li> <li>Parenchymal heterogeneity</li> <li>Isodense/hyperdense regenerative nodules</li> <li>Portal venous supply to dysplastic nodules</li> <li>Ascites</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Not the appropriate imaging technique</li> </ul>	<ul style="list-style-type: none"> <li>Not the appropriate imaging technique</li> </ul>
<b>Abdominal tuberculosis</b>	<ul style="list-style-type: none"> <li>Peritoneal/caecal thickening</li> <li>Lymphadenopathy</li> <li>Ascites</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Circumferential wall thickening of terminal ileum and caecum</li> <li>Asymmetric thickening of ileocecal valve</li> <li>Lymphadenopathy</li> <li>No adnexal mass</li> <li>Involvement of lungs</li> </ul>	<ul style="list-style-type: none"> <li>Lymphadenopathy</li> <li>Bronchogenic spread</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Lymphadenopathy</li> <li>No adnexal mass</li> </ul>
<b>Congestive heart failure</b>	<ul style="list-style-type: none"> <li>TTE</li> <li>Disturbed ventricular function, size, wall thickness, wall motion and/or valve function</li> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Pleural effusion</li> <li>Disturbed ventricular size, wall thickness</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Disturbed ventricular size, wall thickness</li> </ul>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Disturbed ventricular size, wall thickness</li> </ul>
<b>Nephrotic syndrome</b>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Pleural effusion</li> <li>Congenital kidney diseases</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>	<ul style="list-style-type: none"> <li>Ascites</li> <li>Pleural effusion</li> <li>No adnexal mass</li> </ul>

Table 2: Differential diagnosis table for Meigs' syndrome.

#### ABBREVIATIONS

BNP = B-type Natriuretic Peptide  
CA-125 = Cancer Antigen 125  
CT-scan = computed tomography scan  
IOTA = International Ovarian Tumour Analysis  
NT-proBNP = N-Terminal pro B-type Natriuretic Peptide  
TAH-BSO = Total abdominal hysterectomy and bilateral salpingo-oophorectomy  
TTE = Trans Thoracic Echocardiography  
US = Ultrasound  
VEGF = Vascular Endothelial Growth Factor

#### KEYWORDS

Meigs' syndrome; pseudo-Meigs' syndrome; ovarian cancer; hydrothorax; ascites

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