

Unusual case of Krukenberg tumors diagnosed in early pregnancy

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Summary

We present a case with Krukenberg tumors diagnosed in the first trimester of pregnancy. Ultrasound (US) led to early suspicion of the disease and serial scans allowed the natural course of metastatic gastric cancer to be followed. Successful treatment with palliative surgery and chemotherapy resulted in good maternal and foetal outcomes. International collaboration whereby the US findings were discussed with leading European experts enabled faster decision making during the clinical work-up of this rare case.

Key words: Krukenberg tumor; Cancer in pregnancy; Gastric cancer; Metastatic ovarian tumors.

A 36-year old woman was consulted at a tertiary oncogynaecology unit due to bilateral ovarian lesions at the 7th week of gestation (WG). Ultrasound (US) revealed viable pregnancy as well as multilocular cystic lesions in both ovaries measuring 7 cm and 6 cm at the largest diameter. At the 12th WG, the ovarian lesions had doubled in size and were classified as multilocular solid, with abundant blood flow in the solid component (CS-4). Repeat scan after a week revealed fast growth of the tumors and increased size of the highly vascularised solid component (Figures 1–2). The pregnancy kept developing normally.

European experts were asked for their opinions regarding the nature of these tumors (Table 1). They all agreed on a high probability of malignancy, possibly of metastatic origin.

The same week the patient was admitted to hospital because of strong abdominal pain. Gastroscopy revealed an infiltrative tumor of the stomach and biopsy confirmed an intestinal type, moderately differentiated gastric adenocarcinoma. CT showed no other metastatic lesions. It was decided to start treatment with neoadjuvant chemotherapy. However, laparotomy was performed at the 14th WG because of pressure and severe pain. Palliative bilateral adnexectomy and multifocal biopsies were performed (Figure 4). Histology confirmed Krukenberg tumors of the ovaries with no omental disease, but with nodules of adenocarcinoma in the peritoneum.

The patient received 6 courses of chemotherapy with cisplatin and capecitabine starting in the 16th WG and this was well tolerated. One week after the last chemotherapy in the 34th WG, the patient was re-admitted due to severe preeclampsia and suspicion of intrauterine growth restriction. Urgent C-Section was performed due to foetal distress and gave a baby boy of 1114 grams. No visible carcinosis

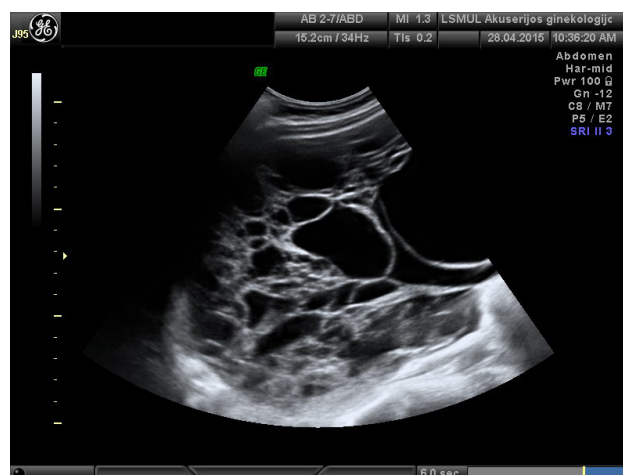


Figure 1. — Tumor of the right ovary (size 21 × 14 × 22 cm).

was found in the abdomen or pelvis during surgery and was confirmed by CT scan.

CT scan showed no visible spread of the disease. The patient received another 8 rounds of chemotherapy followed by total gastrectomy, lymphadenectomy and cholecystectomy.

Twenty months after the treatment, metastatic disease was found in the liver. The patient received another round of chemotherapy. Four years after the diagnosis both mother and the child are in good condition.

Discussion

Krukenberg tumors account for 2.8% of all ovarian metastases, with up to half of them originating from the stomach [1–3]. Several US features of Krukenberg tumors have been described, including typical presentation as bi-

Table 1. — “Opinions of ultrasound experts from Oncogynaecology centres in Europe”.

| | |
|---|--|
| Dr. Dorella Franchi (European Institute of Oncology, Milan, Italy) | “It could probably be a metastatic tumor...” |
| Prof. Lil Valentin (Lund University, Malmö, Sweden) | “The grey scale ultrasound appearance suggests a mucinous tumor, but it is very rare for a mucinous tumor, be it benign, BOT or invasive mucinous cancer, to be bilateral (invasive are bilateral in 10–15% of cases). Therefore, Dorella’s suggestion that this could be a metastasis (probably from a gastrointestinal tumor such as colon, gall bladder/ducts, or pancreas) is not unlikely. However, metastases are rarely as big as these. So further work up regarding a primary malignancy is needed, even though primary ovarian origin is not excluded. Continued expectant management is not advised”. |
| Prof. Antonia Testa (Catholic University of Sacred Heart, Rome, Italy) | “This is a very particular case. The bilaterality, the morphology, the rapid growth.... everything sounds to me as MALIGNANCY: Mucinous carcinoma or pseudomyxoma”. |
| Prof. Dirk Timmerman (IOTA coordinator, Leuven University, Belgium) | “I agree with Dorella, Lil and Antonia. Maybe you can check potential biomarkers (e.g. pancreatic cancer: CA19-9, amylase; colon cancer: CEA....). Despite the fact that none of them is fully reliable an unexpected high result may give more evidence of a metastatic tumor”. |

Table 2. — US features of Krukenberg tumors during pregnancy.

| Color score | Bloch M. H. <i>et al.</i> [3] | Testa A. C. <i>et al.</i> [6] | Chou M. M. <i>et al.</i> [7] | Kim S. H. <i>et al.</i> [8] | Co P. V. <i>et al.</i> [9] | Ozdegirmenci O. <i>et al.</i> [10] |
|---------------|-------------------------------|-----------------------------------|------------------------------------|-----------------------------|-------------------------------|------------------------------------|
| Type of tumor | Solid + cystic component | solid | solid, with “moth-eaten” cyst | solid | Solid + cyst | solid |
| Diameter (cm) | 18 | 16.5 | 12 | 18 | 13.4 | 10 |
| Echogenicity | n/a | homogeneously, hyperechoic | heterogenous, with hypoechoic zone | heterogenous | heterogeneous + anechoic cyst | heterogeneous |
| Color score | increased blood flow (CS-3) | abundant vascularisation (CS 3–4) | CS-3 | n/a | n/a | increased vascularisation |
| Ascites | + | - | + | + | + | - |

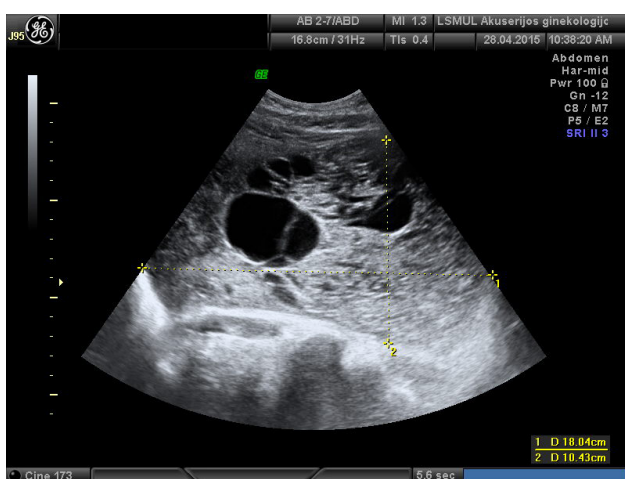


Figure 2. — Tumor of the left ovary (size 18 × 10 × 13 cm).

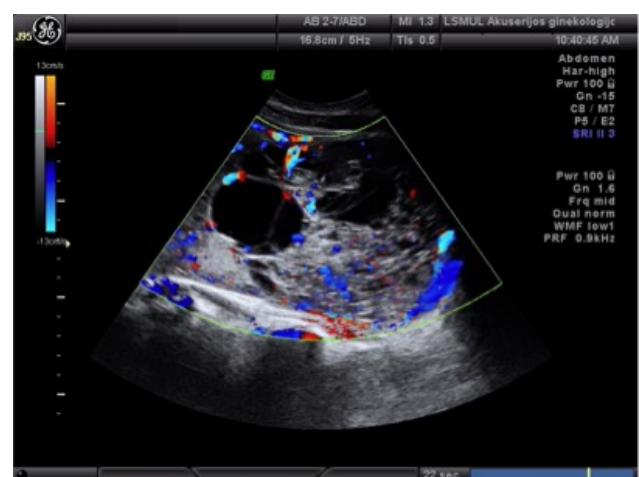


Figure 3. — Blood flow of the ovarian tumor (left ovarian tumor).

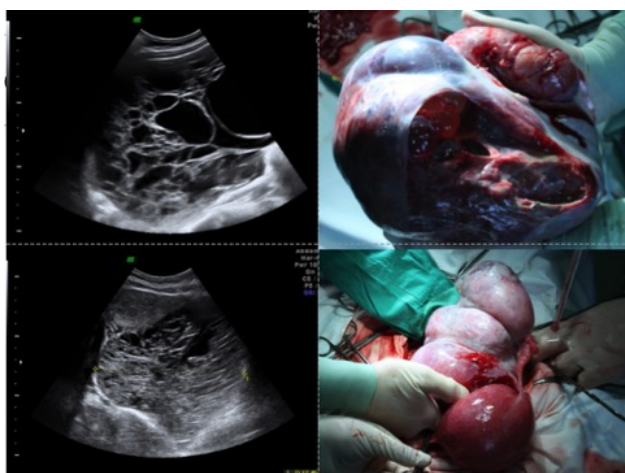


Figure 4. — Macroscopic appearance of the ovarian tumors during surgery and on ultrasound.

lateral, solid ovarian masses with well-defined margins and characteristically irregular hypoechoic structures within the tumor, as well as “moth-eaten” like cysts [4]. US features of 67 patients with ovarian metastases were analysed in a study by Testa *et al.* [5]. All the Krukenberg tumors were of gastric origin and most showed the previously described features. Hypoechoic areas within the solid tumor structure were possibly related to necrotic zones. Most of the tumors were moderately or richly vascularised (CS 3–4) [5].

Less than 70 cases of Krukenberg tumors during pregnancy were reported in PubMed from October 1955 to January 2019 (key words: “Krukenberg tumor”, “pregnancy”). The US features of adnexal masses were described in only 6 of these reported cases [3, 6–10], with the data presented in Table 2. All authors described the tumors as a solid heterogeneous mass with clear borders. In two cases [3, 9] it was noted the tumor had a cystic component, however the size was not reported and the pathologist classified the tumors as solid masses. In one case [7] a “moth-eaten” cyst was reported within the solid structure of the tumor. Abundant vascularisation of the tumors or significant ascites were mentioned in 4 cases. All of these sonographic features concur with the sonographic appearance of Krukenberg tumors observed in non-pregnant women.

However, in the present case the Krukenberg tumors showed different features that changed rapidly during pregnancy. Initially diagnosed as bilateral multilocular cystic lesions at the 7th WG, they were classified as multilocular–solid at the 12th WG. The tumors showed a high rate of growth and a progressive increase in the solid component. We speculate that pregnancy could be associated with a different appearance of Krukenberg tumors, which are usually considered as solid lesions with rather typical appearance upon subjective US evaluation. A predominant cystic component, rapid growth and changes in structure can be potentially misleading and thus present a challenge for accurate diagnosis. Due to the aggressive nature of this disease, early

diagnosis is critically important. During pregnancy, an alert for malignancy should be raised when malignancy-related features of ovarian lesions such as multilocular solid lesions with a diameter of more than 10 cm and strong blood flow (according to IOTA simple rules [11]) are observed.

The management of metastatic gastric cancer diagnosed in pregnancy is challenging. A 2009 review by Sakamoto *et al.* [12] recommended termination and the following treatment if gastric carcinoma was diagnosed before the 22nd WG. However, according to a more recent recommendation, even if the disease is diagnosed in early pregnancy, surgery can be performed safely without ending the pregnancy, followed by chemotherapy after the second trimester [13]. We agree with Sakamoto and colleagues that pregnancy should not compromise the treatment of cancer once this is confirmed. However, the present case demonstrates that a diagnosis of metastatic gastric cancer in early pregnancy does not always require termination of pregnancy.

Krukenberg tumors in pregnancy are associated with a very poor median survival outcome of approximately 6 months. Independent factors for poor prognosis are reported to be dyspnoea and carcinomatosis in the abdomen [14]. It was suggested that radical surgery of the primary cancer could lead to better prognosis. In the present case, palliative surgery only was performed to alleviate the pressure symptoms of ovarian tumors. The disease responded well to chemotherapy, which was initiated in the second trimester of pregnancy.

In conclusion, a consecutive management strategy led to good neonatal outcome and 4 years of survival with satisfactory quality of life after a diagnosis of advanced gastric cancer.

Ethics approval and consent to participate

The patient gave informed consent for the publication of this case report and for the use of images.

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Conflict of Interest

The authors declare no conflict of interest.

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