Burkitt's lymphoma of the breast metastatic to the ovary diagnosed during pregnancy

In September 2010, a 30-year-old primigravida at 16 weeks of gestation was referred to our institution because of rapid and progressive bilateral enlargement of her breasts. Physical examination disclosed enlarged, grossly indurated breasts with tightness of the skin (Figure 1a) and no peripheral adenopathy. Ultrasound examination of the breasts revealed increased glandular vascularization and diffuse parenchymal disease without focal masses (Figure 2). Transvaginal sonography showed bilateral ovoidal solid ovarian masses, 7 cm (right) and 6.4 cm (left) in size, with homogeneous hypoechoic echostructure and regular margins (Figure 1b). On color Doppler examination, rich vascularization was detected; in particular, a main tree-shaped vessel corresponding to the so-called 'lead vessel', described in the literature as strongly predictive of metastatic ovarian tumor, was

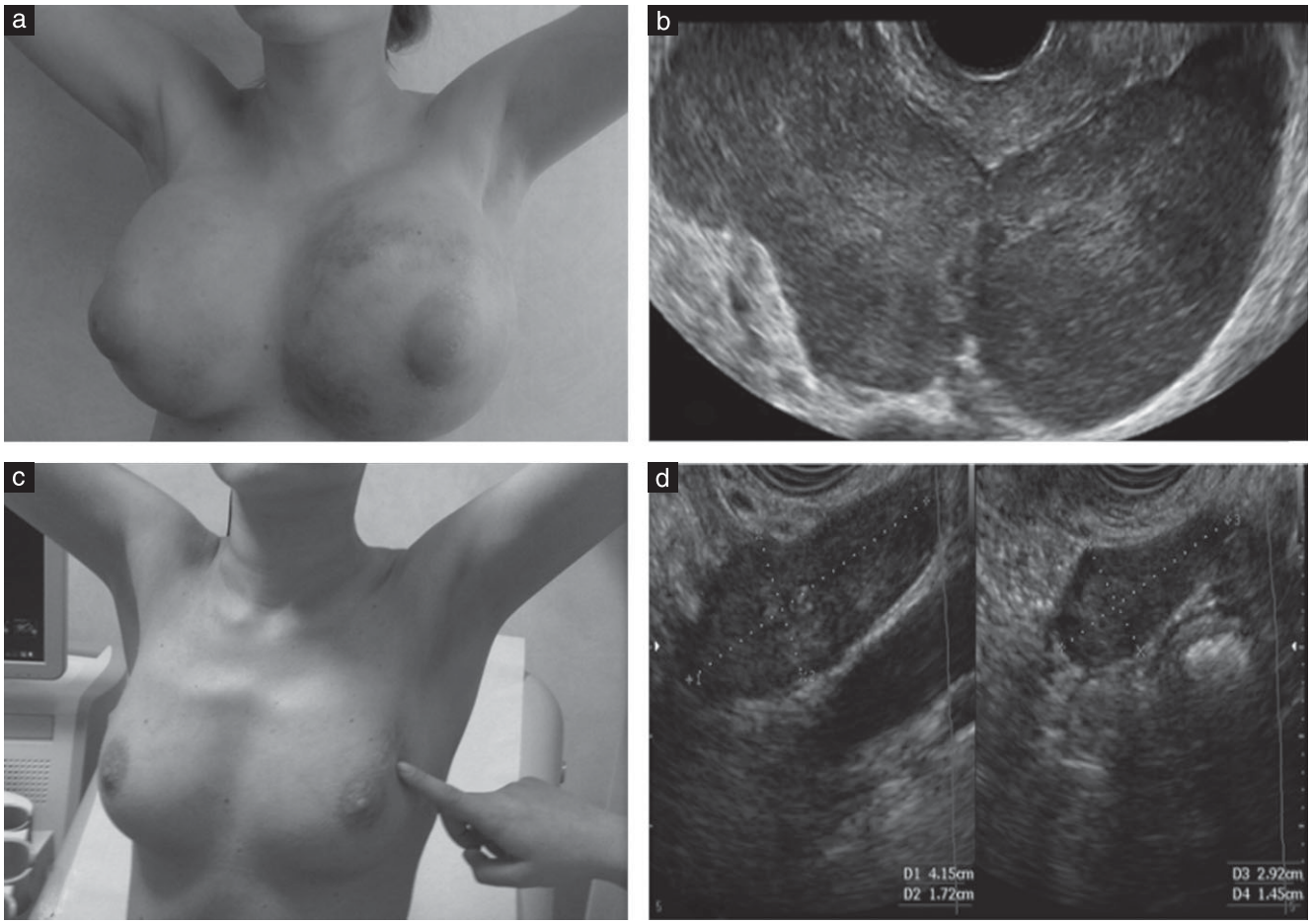

Figure 1 Enlargement of both breasts (a) and ultrasound appearance of the ovarian masses (b) before treatment. Breasts (c) and ovaries (on ultrasound examination) (d) appeared normal after treatment.

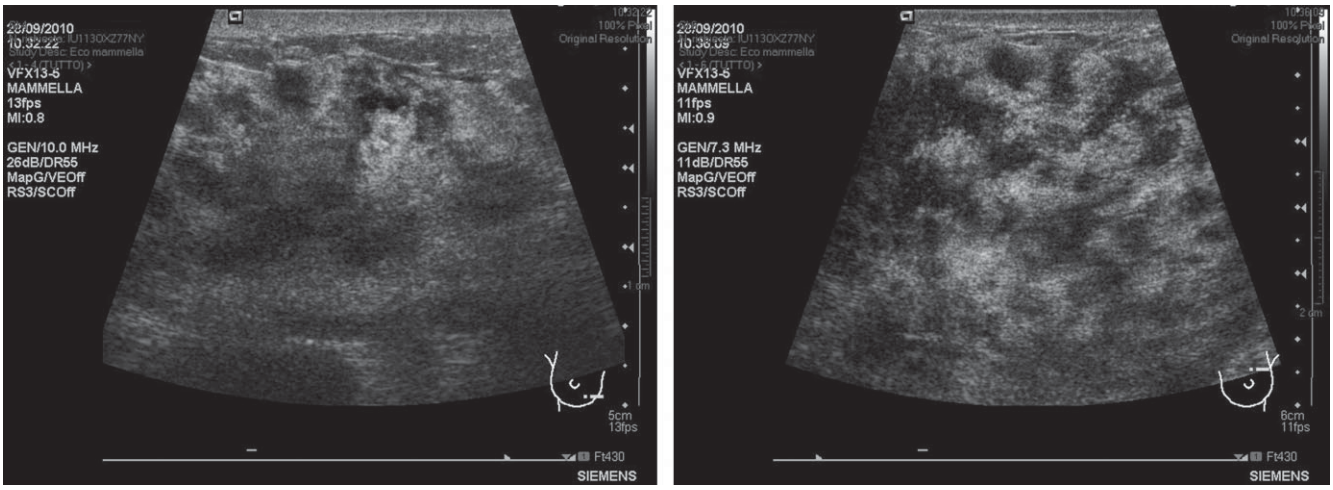

Figure 2 Breast ultrasound images showing heterogeneous echotexture and mild thickening of the skin.

observed[1] (Figure 3). No ascites was documented. The sonographic characteristics prompted us to suspect the presence of metastatic disease of the ovary from a primary unknown tumor. Excisional biopsy of the left breast and biopsies of both ovarian masses were performed. Laparoscopic examination confirmed the ultrasound findings and was negative for abdominal carcinomatosis. Both morphological and immunophenotypic characteristics of breast and ovarian biopsies were indicative of Burkitt's lymphoma. Bone marrow examinations were negative.

The patient's clinical condition rapidly deteriorated, and it was felt that prompt treatment was essential. After careful counseling on disease prognosis and fetal risks related to the cytotoxic treatment, chemotherapy

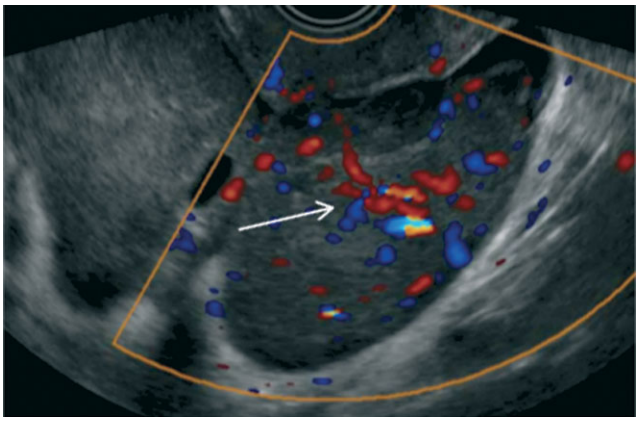

Figure 3 Color Doppler examination of ovarian mass showing rich vascularization and in particular a main tree-shaped vessel, corresponding to the so-called 'lead vessel' (arrow).

was initiated according to a treatment protocol known as the Magrath protocol, which consists of alternating cycles of intensive chemotherapy, but with intravenous and intrathecal methotrexate omitted[2]. On day 40 after the start of treatment and at a gestational age of 22 weeks, fetal heart beats and movements were no longer detected, and spontaneous delivery ensued. One week after dilatation and curettage of the uterine cavity, anti-lymphoma therapy was resumed, including methotrexate and the CD20 monoclonal antibody, rituximab. A whole-body computed tomography scan revealed complete radiological response on day 106. On clinical examination after the end of therapy, both breasts appeared to be of normal dimensions and morphology (Figure 1c) and transvaginal ultrasound examination revealed ovaries of normal size and regular echostructure (Figure 1d). At 31 months from diagnosis, the patient remained disease free.

Burkitt's lymphoma is a highly aggressive malignancy that may develop during pregnancy; rare cases of the condition presenting as primary bilateral breast tumors during pregnancy or after (during lactation) have been previously described[3], and cases of ovarian location during pregnancy appear to be even more rare[4]. The rarity and unfavorable clinical behavior of this condition represent a challenge for clinicians because the prognosis of this chemosensitive tumor is strictly dependent on early diagnosis and prompt therapy, which also has to take into account the high risk of fetal loss, particularly during the first trimester[5,6]. Although sonography has been the most frequently used diagnostic approach during pregnancy in most published cases[4], the sonographic features of ovarian masses have not previously led to the prompt suspicion of metastatic ovarian disease, the diagnosis being made only after definitive pathological examination. Conversely, in our case, the detection of bilateral solid ovarian masses with the typical vascularization of metastatic tumors, namely the 'lead vessel'[6], contributed to the examiner's confidence in making the diagnosis of metastases to the ovary. This experience confirms the role of ultrasound examination in the management of adnexal masses, in particular during pregnancy. Ultrasound also has the advantage of being readily available, quick to perform, inexpensive and widely accepted by patients.

A. C. Testa*, I. De Blasis, A. Di Legge, P. Belli, S. Hohaus and G. Ferrandina
Department of Obstetrics and Gynecology (Gynecologic Oncology Unit), Catholic University of the Sacred Heart, Rome, Italy
**Correspondence.*
(e-mail: atesta@rm.unicatt.it)

DOI: 10.1002/uog.12533

References

1. Testa AC, Mancari R, Di Legge A, Mascilini F, Salutari V, Scambia G, Ferrandina G. The 'lead vessel': a vascular ultrasound feature of metastasis in the ovaries. *Ultrasound Obstet Gynecol* 2008; **31**: 218–221.
2. Mead GM, Sydes MR, Walewski J, Grigg A, Hatton CS, Pescosta N, Guarnaccia C, Lewis MS, McKendrick J, Stenning SP, Wright D; UKLG LY06 collaborators. An international evaluation of CODOX-M and CODOX-M alternating with IVAC in adult Burkitt's lymphoma: Results of United Kingdom Lymphoma Group LYO6 study. *Ann Oncol* 2002; **13**: 1264–1274.
3. Savvari P, Matsouka C, Barbaroussi D, Christoulas D, Nikitas N, Dimopoulos MA, Papadimitriou CA. Burkitt's lymphoma in pregnancy with bilateral breast involvement: case report with review of the literature. *Onkologie* 2010; **33**: 461–464.
4. Magloire LK, Pettker CM, Buhimschi CS, Funai EF. Burkitt's lymphoma of the ovary in pregnancy. *Obstet Gynecol* 2006; **108**: 743–745.
5. El-Hemaidi I, Robinson SE. Management of haematological malignancy in pregnancy. *Best Pract Res Clin Obstet Gynaecol* 2012; **26**: 149–160.
6. Testa AC, Licameli A, Di Legge A, Mascilini F, Petruzziello L, Pelagalli M, Scambia G, Ferrandina G. Color Doppler sonographic features of a Krukenberg tumor in pregnancy. *J Ultrasound Med* 2009; **28**: 695–698.