Case Report

Diagnosis of a small Leydig cell tumor by dynamic contrast-enhanced and diffusion-weighted magnetic resonance imaging

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Leydig cell tumors are usually small and resemble normal ovarian stroma, so they are often difficult to localize. Here, we present a rare case in a 39-year-old woman which dynamic contrast-enhanced and diffusion-weighted magnetic resonance imaging findings showed some differences between a Leydig cell tumor and normal ovarian stroma. Combining these 2 MRI techniques may be useful for diagnosing a Leydig cell tumor.

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Introduction

Leydig cell tumors account for less than 0.1% of all ovarian tumors and are usually benign and unilateral. They are functional and often produce testosterone, which can cause virilization, muscular hypertrophy, and increased muscle mass. They are most commonly found in postmenopausal women [1]. Because these tumors are mostly small and resemble normal ovarian stroma, they are often difficult to localize [2,3]. Here, we present a rare case in which magnetic resonance imaging (MRI) found some differences between a Leydig cell tumor and normal ovarian stroma.

Case report

A 39-year-old woman presented with virilization, including irregular menstruation, hirsutism, and weight gain that had

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been present for several years. She was 160 cm tall, weighed 78 kg, and had a body mass index of 30.5. Her voice had deepened, she had increased body hair on her arms and chest, and her clitoris was enlarged. In blood tests, the free testosterone level was 15.5 pg/mL (normal value: < 1.9 pg/mL) and the testosterone level was 11.1 ng/mL (normal value: 0.11-0.47 ng/mL). The level of dehydroepiandrosterone sulfate was normal, as were the levels of other hormones. We diagnosed the patient with hyperandrogenism on the basis of the blood test, but we found no abnormality in the adrenal gland in the dexamethasone suppression test or computed tomography (CT).

Pelvic MRI showed that the right ovary was slightly enlarged compared with the left ovary, but the left and right ovaries were isointense on the T1-weighted image (T1WI). In the right ovary, the T2-weighted image (T2WI) and diffusion-weighted image (DWI) each showed a slightly higher signal intensity and the apparent diffusion coefficient (ADC) value was 0.96 × 10⁻³mm²/s (left ovarian stroma: 1.21 × 10⁻³mm²/s). Dynamic contrast-enhanced MRI (DCE-MRI) revealed a 1.5 cm-diameter early marked enhancement and a delayed mild enhancement in the right ovary. There was no marked enhancement on the left ovary. On the basis of these findings, we suspected the presence of a functional tumor in the right but not in the left ovary (Figs. 1 and 2).

To confirm the localization of the androgen-secreting tumor and decide on treatment, we performed selective ovarian venous hormonal sampling (SOVHS). Free testosterone levels were abnormally high in blood from the right ovarian vein but were normal in blood from the left ovarian vein. The patient underwent laparoscopic right oophorectomy, and pathological examination of the ovary identified a Leydig cell tumor (size: 1.5 × 1.5 × 1.3 cm). The abnormal hormonal levels normalized on the day after excision.

Discussion

Leydig cell tumors represent less than 0.1% of all ovarian tumors [1]. They are androgen-producing tumors and cause virilization. They are usually benign and are found mainly in postmenopausal women [2]. Most Leydig cell tumors are small, with an average size of 2.4 cm, and 95% of them are unilateral [1,3]. Small tumors often are difficult to localize [1].

Transabdominal ultrasonography (US) and CT are performed to detect ovarian tumors. However, Leydig cell tumors are reportedly isoechic to the ovary on transabdominal US and isodense to the ovary on CT, making them difficult to identify [4]. Transvaginal color Doppler US and MRI may be
useful for detecting Leydig cell tumors [3] because the tumors are moderately or abundantly vascularized on color Doppler US examinations [1,3] and display generally low signal intensity on T1WI and moderately high signal intensity on T2WI [2,3]. However, signal intensity on T2WI varies depending on the contents of the fibrous stroma [5]. Chemical-shift MRI may also be useful because the lipid components of the tumors cause a diffuse signal-intensity drop on the opposed-phase image compared with the in-phase image [5]. In Leydig cell tumors, DCE-MRI shows a gradually increasing and delayed enhancement, DWI shows a slightly higher intensity, and the ADC value is low [5,6]. In our case, the imaging findings of DCE-MRI and DWI showed the same pattern. Because signal intensity on T2WI varies according to the contents of the fibrous stroma [5], the imaging findings of DCE-MRI and DWI may show characteristic features of Leydig cell tumors and may be useful for diagnosis.

As mentioned above, Leydig cell tumors are mostly small and therefore imaging may not be able to localize them. In women with hyperandrogenism who are suspected to have a small androgen-producing tumor, SOVHS may be useful because it can localize the tumor by comparing testosterone levels in blood samples from the left and right ovarian veins, left and right renal veins, and inferior vena cava. Although 5 cases of bilateral tumors are reported in the literature, Leydig cell tumors are unilateral in 95% of cases, which underlines the importance of using SOVHS to localize the tumor [7]. In our case, we performed SOVHS because, although we suspected the presence of a functional tumor in the right ovary, MRI could not rule out the presence of such a tumor in the left ovary. SOVHS confirmed that no tumor was present in the left ovary, so we were able to cure the patient by excising only the right ovary.

A diagnosis of Leydig cell tumor can be made from characteristic symptoms and imaging findings. In particular, DCE-MRI and DWI are useful for diagnosing the presence of these small tumors, which are difficult to distinguish from normal ovarian tissue. Additional SOVHS may also be necessary to rule out the presence of small tumors in normal ovaries.

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