Symptomatic ovarian steroid cell tumor not otherwise specified in a post-menopausal woman

Neha Sood,1 Kaniksha Desai,2 Ana-Maria Chindris,3 Jason Lewis,3 Tri A. Dinh1
1Department of Medical and Surgical Gynecology, 2Division of Endocrinology, 3Department of Pathology, Mayo Clinic, Jacksonville, FL, USA

Abstract

Steroid cell tumor not otherwise specified (NOS) is a rare subtype of sex cord stromal tumor of the ovary and contributes less than 0.1% of all ovarian neoplasms. The majority of tumors occur in pre-menopausal women (mean age: 43 years), in which 56.77% of patients present with virilization due to excess testosterone. An 80-year-old woman with worsening alopecia and excessive growth of coarse hair on abdomen and genital area was found to have elevated serum testosterone level (462 ng/dL) and androstenedione 225 ng/dL (normal 30-200 ng/dL) were found. Serum luteinizing hormone (23.3 IU/L), follicle stimulating hormone (38.8 IU/L), estradiol (64 pg/mL), DHEAS (99.3 mcg/dL), CA-125 (13 U/mL) were normal. Renal and liver functions were within normal limits. A negative dexamethasone suppression test ruled out subclinical Cushing syndrome.

Pelvic ultrasound showed normal left (3.0x 1.7x 2.0 cm) and right (2.0x1.2x1.5 cm) ovaries. No ascites or other abnormalities were present. Computed tomography (CT) abdomen and pelvis demonstrated bilateral adrenal adenomas, right (1.6 cm) and left (1.7 cm). Bilateral adrenal venous sampling ruled out the adrenal gland as origin of hormone secretion. A diagnostic and therapeutic bilateral salpingo-oophorectomy confirmed steroid cell tumor NOS of the left ovary. Post-operatively, the patient had complete resolution of her symptoms and normalization of testosterone level. Our case emphasizes the importance of a clinical suspicion for an occult testosterone secreting ovarian tumor in a symptomatic patient without obvious ovarian mass on imaging.

Case Report

An 80 year old post-menopausal woman was evaluated in our clinic complaining of worsening alopecia and excessive growth of coarse hair on her abdomen and genital area for one year. She also reported an unusual increase in her libido for the past 6 months. There was no history of acne, deepening of voice, blurred vision, weight gain, muscle weakness or striae. Her medical history was significant for essential hypertension which was recently uncontrolled on her home regimen of diltiazem 240 mg. Prior to our evaluation, her physician prescribed oral estrogen and testosterone to alleviate her symptoms. Subsequently she was found to have an elevated testosterone level (446 ng/dL) and was advised to discontinue oral hormonal supplements. On physical examination her BMI was 32.5 kg/m² with an elevated systolic blood pressure of 165 mmHg. Alopecia, increased facial hair and coarse hair on lower abdomen and thighs were noted. Pelvic examination was remarkable for an enlarged clitoris with no obvious adnexal masses. Elevated serum testosterone level of 462 ng/dL (normal 8-60 ng/dL) and androstenedione 225 ng/dL (normal 30-200 ng/dL) were found. Serum luteinizing hormone (23.3 IU/L), follicle stimulating hormone (38.8 IU/L), estradiol (64 pg/mL), DHEAS (99.3 mcg/dL), CA-125 (13 U/mL) were normal. Renal and liver functions were within normal limits. A negative dexamethasone suppression test ruled out subclinical Cushing syndrome.

Discussion

The histopathological term steroid cell tumor of the ovary was first described by Scully.3 Formerly classified as lipid or lipoid cell tumor, this description was later discontinued as the growths had little or no fat content.4 These rare tumors are now reclassified as sex cord stromal tumors, and account for less than 0.1% of all ovarian neoplasms.5 Based on the cell of origin, steroid cell tumors are categorized into three subtypes: Stromal luteomas arising from ovarian stromal cells, Leydig cell tumor arising from Leydig cells in the hilum of the ovary, and steroid cell tumor not otherwise specified (NOS) when the lineage of the tumor cell cannot be identified.6 The last subtype account for the majority of tumors (60%) and tend to affect younger women (mean age; 43 years), as compared to the other two subtypes.7 The tumors are usually unilateral, though in rare cases (6%), they can involve both ovaries. Steroid cell tumors NOS are usually benign; however, clinically malignant behavior, including peritoneal metastases, occurs in 25-40% of patients.8 Clinical manifestations are defined by the type of hormone produced by steroid cell tumors, NOS. Most secrete testosterone (56 to 77%) and patients present with virilizing symptoms such as gradually progressive hirsutism, acne, deepening of voice, temporal baldness and amenorrhea (Table 1).8,9 This was the presentation in our patient who had rapidly progressive virilization over the course of one year. Hyperestrogenemia presenting as menorrhagia or irregular uterine bleeding has been reported in 6 to 23% of women.1 In 6 to 10% of cases, excess cortisol secretion can lead to Cushing syndrome.10,11 However, 25% of patients with steroid cell tumor NOS are asymptomatic.10 Histopathology remains the gold standard for diagnosis. Grossly, steroid cell tumor NOS is well circumscribed, solid and non-calcified with a lobulated appearance.10,12 Cross section generally shows a yellow-orange surface with occasional cystic changes.13 On micro-

Correspondence: Tri A. Dinh, Department of Medical and Surgical Gynecology, Mayo Clinic, 4500 San Pablo Road S, Jacksonville, 32224 FL, USA.
Tel.: +1.904.953.2978 - Fax: +1.904.953.0606.
E-mail: dinh.tri@mayo.edu
Key words: Steroid cell tumor not otherwise specified (NOS), virilization; adrenal venous sampling.

Contributions: the authors contributed equally.
Conflict of interest: the authors declare no potential conflict of interest.

Received for publication: 10 September 2015.
Revision received: 9 December 2015.
Accepted for publication: 16 December 2015.

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).

©Copyright N. Sood et al., 2016 Licensee PAGEPress, Italy Rare Tumors 2016; 8:6200 doi:10.4081/rt.2016.6200
| Year  | Author            | Cases | Age, years | Clinical presentation                                                                 | Management                                                                 |
|-------|-------------------|-------|------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1987  | Hayes et al.      | 63    | 2.5-80     | Virilization + Hyperestrogenism + Cushing’s syndrome                                   | Unknown                                                                   |
| 1991  | DeFreitas et al.  | 1     |            | Virilization + Increased libido                                                       | Bilateral ovarian venous sampling + Bilateral salpingo-oophorectomy         |
| 1991  | Harris et al.     | 1     | 8          | Progressive virilization                                                             | Oophorectomy                                                              |
| 1995  | Donovan et al.    | 1     |            | Cushing’s syndrome                                                                     | Ketoconazole + Multiagent chemotherapy                                      |
| 1996  | Elhaad et al.     | 1     | 73         | Cushing’s syndrome + Peritoneal metastasis post-surgery                                | Bilateral ovarian venous sampling + Laparoscopy                            |
| 1997  | Aalderi et al.    | 1     | 21         | Virilization + History of accelerated linear growth                                   | Bilateral ovarian venous sampling + Exploratory Lap                        |
| 1998  | Wang et al.       | 1     | 50         | Persistent elevation of serum testosterone (Post-surgical removal of SCT NOS Stage III) | GnRHa                                                                     |
| 1998  | Brewer et al.     | 1     |            | Progressive disease after surgical debulking + Multiagent chemotherapy               | GnRHa                                                                     |
| 1999  | Reedy et al.      | 1     | 46         | Pelvic mass + Virilization                                                           | Exploratory Lap + TAH + Left salpingo-oophorectomy + Pelvic/ para-aortic LN sampling |
| 2002  | Csereyes et al.   | 1     | 49         | Progressive virilization                                                             | Bilateral ovarian venous sampling + Bilateral salpingo-oophorectomy (Postpseudovaginal hysterectomy) |
| 2003  | Dewers et al.     | 1     | 24         | Progressive virilization                                                             | Laparoscopic removal of the accessory ovarian tumor                        |
| 2003  | Vukov et al.      | 1     | 37         | Primi grade at 12 weeks + Hirsutism                                                  | Left salpingo-oophorectomy + Left pelvic lymph node dissection + Omental biopsy |
| 2006  | Molany et al.     | 1     | 30         | Pelvic mass                                                                           | Laparoscopic removal of the accessory ovarian tumor                        |
| 2007  | Saiida et al.     | 1     | 28         | Virilization                                                                          | Left salpingo-oophorectomy                                                |
| 2007  | Haji et al.       | 1     | 22         | Lactating woman + Amenorrhea + Virilization                                          | Salpingo-oophorectomy                                                     |
| 2007  | Tsj et al.        | 1     | 44         | Virilization + Oligomenorrhea + Non-palpable pelvic mass                              | Exploratory Lap + Right salpingo-oophorectomy                             |
| 2007  | Ding et al.       | 1     | 16         | Amenorrhea + Virilization                                                            | Exploratory lap + Left salpingo-oophorectomy                              |
| 2007  | Kim et al.        | 1     | 52         | Virilization + Massive ascites                                                       | Exploratory lap + BSO + Infracolic omentectomy + Peritoneal biopsies + Pelvic/ para-aortic LN sampling |
| 2008  | Stephens et al.   | 1     | 35         | Cushing syndrome                                                                      | Unknown                                                                    |
| 2008  | Gupta et al.      | 1     | 5.75       | Cushing syndrome                                                                      | Surgery                                                                    |
| 2009  | Sawatiparnich et al. | 1   | 6.3        | Ectopic ACTH syndrome                                                                 | Left salpingo-oophorectomy                                                |
| 2010  | Jones et al.      | 5     | 8.5        | Hypertension + Vaginal spotting                                                       | Exploratory lap + Left salpingo-oophorectomy                              |
| 2011  | Varras et al.     | 1     | 40         | Progressive virilization + Amenorrhea                                                 | TAH + BSO                                                                 |
| 2011  | Lee et al.        | 1     | 8.5        | Amenorrhea + Virilization                                                             | Right oophorectomy                                                       |
| 2011  | Zhang et al.      | 1     | 21         | Virilization + Amenorrhea                                                             | Left oophorectomy                                                        |
| 2012  | Singh et al.      | 1     | 70         | Hirsutism                                                                             | Laparoscopic right oophorectomy                                           |
| 2012  | Tasdemir et al.   | 1     | 51         | Hirsutism + Virilization                                                             | TAH + BSO                                                                 |
| 2013  | Bese et al.       | 1     | 33         | Maternal virilization with male fetus pseudo-hemaphroditism                          | Unknown                                                                   |
| 2013  | Boyrac et al.     | 1     | 16         | Virilization + Amenorrhea                                                             | Exploratory lap + Right ovarian cystectomy                                |
| 2013  | Yilmaz et al.     | 1     | 13         | Precocious puberty                                                                   | Right ovarian cystectomy                                                  |
| 2013  | Sefert et al.     | 1     | 20         | Virilization                                                                          | Laparoscopic right oophorectomy                                           |
| 2014  | Udhreja et al.    | 1     | 28         | Virilization                                                                          | Exploratory Lap + Right oophorectomy                                      |
| 2014  | Li et al.         | 1     | 29         | Pelvic mass                                                                           | Exploratory Lap + Right salpingo-oophorectomy + Chemotherapy               |
| 2014  | Wan et al.        | 1     | 59         | Post-menopausal vaginal bleeding                                                      | Exploratory Lap + TAH + BSO                                               |
| 2014  | Yuan et al.       | 1     | 31         | Hirsutism + Hypertension + Menstrual disorder                                         | Left Salpingo-oophorectomy                                                |
| 2014  | Mizoguchi et al.  | 1     | 23         | Virilization + Oligomenorrhea                                                         | Staging surgery                                                           |
| 2014  | Oz et al.         | 1     | 24         | Primigravida (99 weeks gestation) + Maternal virilization                             | Left Salpingo-oophorectomy                                                |
| 2014  | Choo et al.       | 1     | 35         | Metrorrhagia                                                                          | Exploratory Lap + Right ovarian cystectomy (Followed by 2nd Staging Laparotomy (Right, salpingo-oophorectomy + Pelvic/ para-aortic LN sampling + omentectomy)) |
| 2015  | Haroon et al.     | 1     | 3-70       | Pelvic Mass + Virilization                                                           | Surgery +/- Adjunct chemotherapy                                          |
Inhibin reactivity ranges from 5 to 90%. The absence of cytoplasmic Reinke’s crystals help differentiate this tumor from the Leydig cell neoplasm.

Hayes and Scully have defined five pathological correlates of malignant behavior in these tumors, namely: i) two or more mitoses per 10 high power fields; ii) a tumor diameter of >7 cm; iii) necrosis; iv) hemorrhage; and v) grade 2 to 3 nuclear atypia. Histologically, our patient’s tumor did not have any of the above criteria.

Immunohistochemical markers for inhibin and calretinin are sensitive markers for steroid cell tumors NOS. Calretinin positivity is present in 60 to 90% of tumor cells, whereas inhibitin reactivity ranges from 5 to 90%. Other markers, such as EMA, cytokeratin, CD99 and S100 have been reported to be positive. HMB45, Chromogranin-A, LeuM1, AFP, carcinoembryonic antigen (CEA) and periodic acid Schiff (PAS) are other markers, which have been studied.

A unique scenario of maternal virilization in pregnancy with or without fetal female pseudo hermaphroditism has also been reported. Surgery with salpingo-oophorectomy may be safely performed after the first trimester in these patients to avoid torsion or rupture of tumor and protect the developing fetus from harmful maternal androgens (Table 1). Prepubertal girls presenting with precocious puberty due to excess testosterone from a steroid cell tumor NOS have had a delay in diagnosis and treatment due to confusion with non-classical congenital adrenal hyperplasia (CAH). Thus, failure to respond to treatment for CAH should prompt a consideration for an ovarian etiology in these young patients.

Based on the limited data available, the recommended management of steroid cell tumor NOS is primarily surgical. A benign tumor limited to the ovary in a woman who has completed childbearing should be managed with salpingo-oophorectomy. Conservative surgery with cystectomy has been successfully done in young patients to preserve ovarian function. For patients with a unilateral malignant tumor, but desirous of future fertility, formal staging surgery to include unilateral salpingo-oophorectomy with preservation of the contralateral ovary and uterus is a reasonable option. These patients need careful postoperative surveillance including measurement of sex hormone levels, especially if high levels were present prior to surgery. For tumors found to be malignant after initial conservative surgery, a formal staging procedure at a second surgery should be performed. Brown et al. proposed that surgical staging for a malignant steroid cell tumor does not require formal lymphadenectomy, in contrast to the standard staging procedure for an epithelial ovarian malignancy. Widely metastatic malignant disease should be treated with surgical cytoreduction followed by adjuvant chemotherapy. Although a definitive chemotherapy regimen is not yet defined, Bleomycin, Etoposide and Cisplatin (BEP) is favored and often used. Gonadotropin releasing hormone agonist has been used as therapy for recurrent malignant disease for its suppressive effect on ovarian steroidogenesis.

Our case emphasizes the importance of clinical suspicion for an occult testosterone secreting ovarian tumor in a symptomatic woman without an obvious ovarian mass on radiologic studies. Prompt surgical management can lead to complete resolution of symptoms as well as normalization of excess testosterone levels within weeks. In post-menopausal women who are candidates for surgery, a diagnostic and therapeutic bilateral salpingo-oophorectomy is a safe option. In women with a small adrenal nodule and no ovarian lesions, bilateral adrenal or ovarian venous sampling is a reasonable choice to evaluate the source of excess hormone production before considering surgery.

### References

1. Hayes MC, Scully RE. Ovarian steroid cell tumors (not otherwise specified). A clinicopathological analysis of 63 cases. Am J Surg Pathol 1987;11:835-45.
2. Donovan JT, Otis CN, Powell JL, et al. Cushing’s syndrome secondary to malignant lipid cell tumor of the ovary. Gynecol Oncol 1993;50:249-53.
3. Anneus MW, Natarajan S. Pathologic quiz case: a rare tumor of the ovary. Arch Pathol Lab Med 2003;127:890-2.
4. Outwater EK, Wagner BJ, Mannion C, et al. Sex cord-stromal and steroid cell tumors of the ovary. Radiographics 1998;18:1523-46.
5. Liu AX, Sun J, Shao WQ, et al. Steroid cell tumors, not otherwise specified (NOS), in an accessory ovary: a case report and literature review. Gynecol Oncol 2005;97:260-2.
6. DeFreitas EA, Dudzinski MR, LaRocque JC, et al. Ovarian vein sampling in rapidly progressing virilization. A case report. J Reprod Med 1991;36:546-8.
7. Harris AC, Wakely PE Jr, Kaplowitz PB, et al. Steroid cell tumor of the ovary in a child. Arch Pathol Lab Med 1991;115:150-4.
8. Elhadd TA, Connolly V, Cruickshank D, et al. An ovarian lipid cell tumour causing virilization and Cushing’s syndrome. Clin Endocrinol (Oxf) 1996;44:723-5.
9. Azzizleri H, Tanakol R, Terzioglu T, et al. Steroid cell tumor of the ovary as a rare cause of virilization. Mt Sinai J Med 1997;64:130-5.
10. Wang PH, Chao HT, Lee RC, et al. Steroid cell tumors of the ovary: clinical, ultrasonic, and MRI diagnosis—a case report. Eur J Radiol 1998;26:269-73.

11. Brewer CA, Shevlin D. Encouraging response of an advanced steroid-cell tumor to GnRH agonist therapy. Obstet Gynecol 1998;92:661-3.

12. Reedy MB, Richards WE, Ueland F, et al. Ovarian steroid cell tumors, not otherwise specified: a case report and literature review. Gynecol Oncol 1999;75:293-7.

13. Cserespes E, Szucs N, Patkos P, et al. Ovarian steroid cell tumor and a contralateral ovarian thecoma in a postmenopausal woman with severe hyperandrogenism. Gynecol Endocrinol 2002;16:162-7.

14. Deavers MT, Malpica A, Ordonez NG, et al. Ovarian steroid cell tumors: an immunohistochemical study including a comparison of calretinin with inhibin. Int J Gynecol Pathol 2003;22:113-4.

15. Vullink AJ, Vermes I, Kuiper P, et al. Steroid cell tumour not otherwise specified during pregnancy: a case report and diagnostic work-up for virilisation in a pregnant patient. Eur J Obstet Gynecol Reprod Biol 2004;112:221-7.

16. Mohanty A, Trujillo YP. Virilization and left adnexal mass in a 35-year-old woman. Steroid cell tumor of ovary. Arch Pathol Lab Med 2006;130:113-4.

17. Saita T, Tanaka YO, Minami M. Steroid cell tumor of the ovary, not otherwise specified: CT and MR findings. AJR Am J Roentgenol 2007;188:W393-4.

18. Haji AG, Sharma S, Babu M, et al. Androgen secreting steroid cell tumor of the ovary in a young lactating women with acute onset of severe hyperandrogenism: a case report and review of literature. J Med Case Rep 2007;1:88.

19. Tsai HJ, Chen SC, Wei HY, et al. Hypothyroidism and hyperlipidemia with left adnexal mass in a 35-year-old woman. Steroid cell tumor of the ovary. Arch Pathol Lab Med 2006;130:113-4.

20. Ding DC, Hsu S. Lipid cell tumor in an adolescent girl: a case report. J Reprod Med 2007;52:956-8.

21. Kim YT, Kim SW, Yoon BS, et al. An ovarian steroid cell tumor causing virilization and massive ascites. Yonsei Med J 2007;48:142-6.

22. Stephens JW, Fielding A, Verducker R, et al. A steroid-cell tumor of the ovary resulting in massive androgen excess early in the gonadal steroidogenic pathway. Gynecol Endocrinol 2008;24:151-3.

23. Gupta P, Goyal S, Gonzalez-Mendoza LE, et al. Corticotropin-independent cushing syndrome in a child with an ovarian tumor misdiagnosed as nonclassic congenital adrenal hyperplasia. Endocr Pract 2008;14:875-9.

24. Sawathiparnich P, Sithinamsuwan P, Sanpakit K, et al. Cushing’s syndrome caused by an ACTH-producing ovarian steroid cell tumor, NOS, in a prepubertal girl. Endocrine 2009;35:132-5.

25. Jones MW, Harri R, Dabbs DJ, et al. Immunohistochemical profile of steroid cell tumor of the ovary: a study of 14 cases and a review of the literature. Int J Gynecol Pathol 2010;29:315-20.

26. Varras M, Vasilakaki T, Skafida E, et al. Clinical, ultrasonographic, computed tomography and histopathological manifestations of ovarian steroid cell tumour, not otherwise specified: our experience of a rare case with female virilisation and review of the literature. Gynecol Endocrinol 2011;27:412-8.

27. Lee SH, Kang MS, Lee GS, et al. Refractory hypertension and isosexual pseudohermaphroditism with virilisation in a girl. J Korean Med Sci 2011;26:836-8.

28. Zhang X, Lu B. Ovarian steroidcell tumor, not otherwise specified: an unusual case with myelolipoma. Int J Gynecol Pathol 2011;30:460-5.

29. Singh P, Deleon F, Anderson R. Steroid cell ovarian neoplasm, not otherwise specified: a case report and review of the literature. Case Rep Obstet Gynecol 2012;2012:253152.

30. Tasdemir N, Celik C, Abali R, et al. A rare cause of virilization; ovarian steroid cell tumor, not otherwise specified (NOS): an unusual case with myelolipoma. Int J Gynecol Pathol 2011;30:460-5.

31. Singhp, Deleon F, Anderson R. Ovarian steroid cell tumor, not otherwise specified: a case report and review of the literature. Case Rep Obstet Gynecol 2012;2012:253152.

32. Saita T, Tanaka YO, Minami M. Steroid cell tumor of the ovary, not otherwise specified: CT and MR findings. AJR Am J Roentgenol 2007;188:W393-4.

33. Hasegawa K, Minami Y, Inuzuka H, et al. A rare case with female virilisation and steroid cell tumor of the ovary. Case Rep Obstet Gynecol 2012;2012:253152.

34. Sielert L, Liu C, Nagarathinam R, et al. Ovarian steroid cell tumor, not otherwise specified: a rare case report. Case Rep Med 2013;2013:527698.

35. Yilmaz-Agladioglu S, Savas-Erdeve S, Boduroglu E, et al. A girl with steroid cell ovarian tumor misdiagnosed as non-classical congenital adrenal hyperplasia. Turk J Pediatr 2013;55:443-6.

36. Lee SH, Kang MS, Lee GS, et al. Refractory hypertension and isosexual pseudohermaphroditism with virilisation in a girl. J Korean Med Sci 2011;26:836-8.

37. Hasegawa K, Minami Y, Inuzuka H, et al. A rare case with female virilisation and steroid cell tumor of the ovary. Case Rep Obstet Gynecol 2012;2012:253152.

38. Yuan M, Qiu M, Zhu M. Symptomatic cushing syndrome and hyperandrogenemia revealing steroid cell ovarian neoplasm with late intra-abdominal metastasis. BMC Endocr Disord 2014;14:12.

39. Mizoguchi M, Minami S, Yamamoto M, et al. Ovarian steroid cell tumor, not otherwise specified, producing testosterone. J Obstet Gynaecol Res 2014;40:2081-5.

40. Oz M, Ozgu E, Turks M, et al. Steroid cell tumor of the ovary in a pregnant woman whose androgenic symptoms were masked by pregnancy. Arch Gynecol Obstet 2014;290:131-4.

41. Chung DH, Lee SH, Lee KB. A case of ovarian steroid cell tumor, not otherwise specified, treated with surgery and gonadotropin releasing hormone agonist. J Menopausal Med 2014;20:39-42.

42. Haroon S, Idees R, Fatima S, et al. Ovarian steroid cell tumor, not otherwise specified: a clinicopathological and immunohistochemical experience of 12 cases. J Obstet Gynaecol Res 2015;41:424-31.

43. Jiang W, Tao X, Fang F, et al. Benign and malignant ovarian steroid cell tumors, not otherwise specified: case studies, comparison, and review of the literature. J Ovarian Res 2013;6:53.

44. Zhao C, Vinh TN, McManus K, et al. Identification of the most sensitive and robust immunohistochemical markers in different categories of ovarian sex cord-stromal tumors. Am J Surg Pathol 2009;33:534-66.

45. Movahedi-Lankarani S, Kurman RJ. Calretinin, a more sensitive but less specific marker than alpha-inhibin for ovarian sex cord-stromal neoplasms: an immunohistochemical study of 215 cases. Am J Surg Pathol 2002;26:1477-83.

46. Brown J, Sood AK, Deavers MT, et al. Patterns of metastasis in sex cord-stromal tumors of the ovary: can routine staging lymphadenectomy be omitted? Gynecol Oncol 2009;113:86-90.

47. Kim JS, Park SN, Kim BR. Recurrent ovarian steroid cell tumor, not otherwise specified managed with debulking surgery, radiofrequency ablation, and adjuvant chemotherapy. Obstet Gynecol Sci 2014;57:534-8.