The Use Of ^{75}Se-Selenocholestrol SPECT in the Localization of Steroid-Secreting Tumor

Shmuel Shilo MD[1], Yodphat Krausz MD[4], Constantin Reinus MD[2] and Uzi Beller MD[3]

[1]Endocrine Unit and Departments of [2]Pathology and [3]Gynecology, Shaare Zedek Medical Center and [4]Department of Nuclear Medicine, Hadassah University Hospital, Jerusalem, Israel

Key words: androgen-producing tumor, hirsutism, ^{75}Se-Selenocholesterol SPECT

IMAJ 2001;3:455–456

Androgen-producing tumor in the female may originate either in the ovaries or in the adrenal gland [1]. Although complete biochemical evaluation is useful for the diagnosis of hyper-androgenism, it may be difficult to ascertain the location of the tumor. We report a case of successful localization of an androgen-producing tumor using ^{75}Se-Selenocholesterol single photon emission computed tomography.

Patient Description

A 60 year old woman presented with excessive facial hair of 3 months duration. She had experienced spontaneous menopause at the age of 52. A year later, she underwent left mastectomy for cribriform ductal carcinoma *in situ*, followed by radiotherapy, with no tumor recurrence.

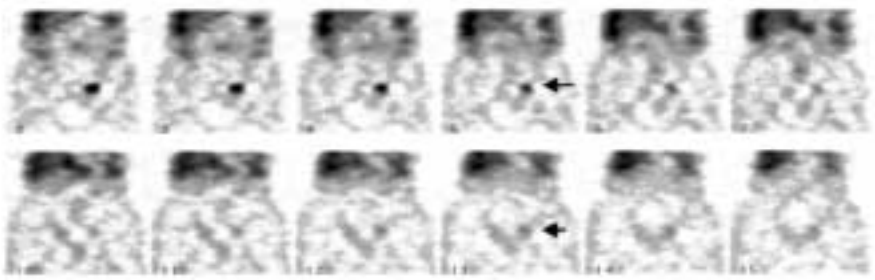
The physical examination was unremarkable, except for left mastectomy and coarse bleached hair on the face in a beard distribution. No pathological hair was seen elsewhere over the body and pelvic examination was normal. Blood tests showed normal erythrocyte sedimentation rate, glucose and electrolytes, and kidney and liver function tests were normal. The endocrinological evaluation revealed normal serum levels of thyroid-stimulating hormone, prolactin, androstendione, dehydroepiandrosterone sulfate, and 17-hydroxyprogesterone. Luteinizing hormone was 34 IU/L (normal range 30–140), follicle-stimulating hormone 90.3 IU/L (normal range 30–150), and cortisol 378 nmol/L (normal range 138–690). Total testosterone was 5.7 and 6.0 nmol/L on two separate occasions (normal range 0–3), and free testosterone 21.5 and 20.1 pmol/L on two separate occasions (normal range 2.4–12.5). Dexamethasone 0.5 mg x 4 for 2 days suppressed the serum cortisol to 33 nmol/L but not the total testosterone, which remained 4.5 nmol/L.

Vaginal ultrasound showed a uterus of 46 x 40 x 50 mm in size without any pathological features. The ovaries were not visualized clearly. Computerized tomography of the abdomen demonstrated normal sized adrenal glands. The left ovary, situated cephalic to its normal position, was mildly enlarged (2.5 cm in diameter) with no defined mass, whereas the right ovary was normal in size and shape. No lymph glands were detectable.

^{75}Se-Selenocholesterol scintigraphy of the abdomen and pelvis was obtained after intravenous administration of 300 μCu of the radiopharmaceutical, with the patient on dexamethasone 2.5 mg/day for suppression of tracer uptake in the zona fasciculata of the adrenal. Serum cortisol was adequately suppressed to 10–33 nmol/L throughout the study. Anterior and posterior views of the abdomen and pelvis were obtained within 72 hours and intermittently up to 19 days after tracer injection. SPECT study was acquired on a 64 x 64 matrix over 360 degrees, at 40 sec/projection. Planar views showed a focus of increased uptake in the left lower abdomen that persisted throughout the study, and the SPECT images disclosed its presence anterior to the left sacroiliac joint [Figure]. This finding was compatible with an androgen-secreting tumor. Faint uptake was observed in both adrenals, with no mass in either.

On laparoscopic surgery the left ovary was mildly enlarged with a 2 cm mass, whereas the uterus and the right ovary were of normal size and structure. Bilateral oophorectomy was performed. Pathological examination indicated that the right ovary and tube were normal,

SPECT = single photon emission computed tomography



Serial coronal sections of tomographic images, anterior (upper left end) through posterior aspect (lower right end), show a focus of pathological uptake in the left ovary (arrow, upper row) anterior to the left sacro-iliac joint (arrow, lower row).

but the left ovary contained a well-circumscribed solid yellow tumor 2 cm in diameter. On microscopic examination the tumor was completely surrounded by ovarian stroma and composed of polyhedral cells arranged in small nests. The cytoplasm was abundant, eosinophilic and slightly granular, and the nuclei were small with prominent nucleoli. No mitotic figures were present. Small nests of lutein cells within ovarian stroma (stromal hyperthecosis) were present in both ovaries. The final pathologic diagnosis was stromal luteoma of the left ovary.

Twenty-four hours following surgery, serum testosterone fell to < 0.3 nmol/L and remained very low throughout 6 months of follow-up. LH and FSH did not rise after surgery, and no menopausal symptoms were noted. Three months later the excessive facial hair was no longer present.

Comment

Hyperandrogenism, leading to excessive facial hair in the postmenopausal woman, may arise from an androgen-producing tumor in the adrenal or in the ovary, or may stem from excessive peripheral androgen precursor conversion or abnormal end-organ sensitivity [2].

Ovarian tumors were initially termed "lipid cell tumor" and "lipoid cell tumor" despite the absence of lipid in up to 25% of the cases. The World Health Organization subsequently applied the term "steroid cell tumors" to these neoplasms, since it reflects both the morphologic features of the neoplastic cells and their propensity to secrete steroid hormones. These steroid cell tumors, which account for only 0.1% of ovarian tumors, have been subdivided into two major subtypes according to their origin: the stromal luteoma and the Leydig cell tumor, and a third subtype, whose cell lineage is uncertain, steroid cell tumor not otherwise specified. Some tumors in the last category are clinically malignant, whereas those in the first two categories are benign. The stromal luteoma lies within the ovarian stroma and is assumed to arise from it. The luteoma accounts for 20% of steroid cell tumors, and in 80% it occurs in postmenopausal women. It is associated with androgenic manifestations in only 12% of cases, while vaginal bleeding is seen in about 60% [3].

Our patient presented with moderate hirsutism, but its rapid progression and the high serum testosterone suggested the presence of a tumor. Biochemical evaluation established the androgen excess but did not help to localize its origin. Pelvic examination, vaginal ultrasound and computerized tomography of the lower abdomen also failed to do so. Scintigraphy, using labeled cholesterol such as NP-59 or ^{131}I-iodocholesterol, can be used to locate the tumor in such cases [1–5]. Gross et al. [2] suggested the use of dexamethasone to suppress the normal tracer uptake in the adrenal cortex, thereby allowing for better visualization of an extra-adrenal androgen-producing tumor. However, in another published case dexamethasone was not used and visualization of the adrenals did not interfere with tracer uptake in the ovary [1]. In our patient the dexamethasone administration led to adequate suppression of the serum cortisol, but the adrenals were faintly visualized. SPECT disclosed focal uptake in the left lower abdomen anterior to the left sacro-iliac joint, above the presumed site of ovary, but this site was compatible with a slight upward position of the ovary.

In summary, we describe a postmenopausal woman with recent onset of mildly excessive facial hair and elevated testosterone. Several localization studies failed to disclose the origin of excess testosterone. ^{75}Se-Selenocholesterol scintigraphy with tomographic imaging pointed to the left ovary as the source of testosterone. Bilateral oophorectomy was performed and a stromal luteoma was identified in the left ovary. Following surgery, the testosterone level returned to normal range and the facial hair disappeared within a few months.

Acknowledgment: The authors gratefully acknowledge the valuable and skillful assistance of B. Glaser MD, in the preparation of the manuscript.

References

1. Younis JS, Bercovici B, Zlotogorski A, Horne T, Glaser B. Lipid cell tumor of the ovary: steroid hormone secretory pattern and localization using ^{75}Se Selenocholesterol. *Gynecol Obstet Invest* 1989;27:110–12.
2. Gross MD, Shapiro B, Thrall JH, Freitas JE, Beiewalters WH. The scintigraphic imaging of endocrine organs. *Endocr Rev* 1984;5:221–81.
3. Scully RE, Young RH, Clement PB. Tumors of the ovary, maldeveloped gonads, fallopian tube, and broad ligament. In: Atlas of Tumor Pathology. Armed Forces Institute of Pathology, 1998:227–37.
4. Glaser B, Weill S, Kahana L, Abramovici H, Sheinfeld M. Leydig cell tumor of the ovary: visualizing using ^{131}I-19-iodocholesterol scintigraphy. *Eur J Nucl Med* 1985;11:13–16.
5. Mounts JM, Gross MD, Shapiro B, Barkan AL, Woodbury MC, Schteingart DE, Ayers JWT. Scintigraphic localization of ovarian dysfunction. *J Nucl Med* 1988;29:1644–50.

Correspondence: Dr. S. Shilo, Endocrine Unit, Shaare Zedek Medical Center, Jerusalem 91031, Israel. Phone: (972-2) 655-5438 , Fax: (972-2) 655-5231, email shilo@szmc.org.il

LH = luteinizing hormone
FSH = follicle-stimulating hormone