SEXUAL MEDICINE ORIGINAL RESEARCH

WOMEN'S SEXUAL HEALTH

Hormone Levels and Sexual Functioning After Risk-Reducing Salpingo-Oophorectomy

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ABSTRACT

Introduction: Women after risk-reducing salpingo-oophorectomy (RRSO) can have impaired sexual functioning, but whether there is an association between hormone levels and sexual functioning is unclear.

Aim: To determine whether hormone levels are associated with sexual functioning in women after RRSO.

Methods: This is a retrospective cohort study of 198 sexually active and 91 inactive women after RRSO. Participants completed the Sexual Activity Questionnaire, questionnaires concerning hormone replacement therapy (HRT), quality of life, care from partner, body image, and comorbidity and provided blood samples. Associations between sexual functioning scores and covariates were examined by linear regression. Variables associated with sexual activity were examined by logistic regression.

Main Outcome Measures: Associations with sexual pleasure and sexual discomfort scores were expressed by multivariable regression coefficients and associations with sexual activity were expressed by odds ratios.

Results: None of the hormone levels were associated with sexual pleasure in contrast to age ($P = .032$), current use of systemic HRT ($P = .002$), and more care form partner ($P < .001$). Increased free androgen index ($P = .016$), more care from partner ($P = .017$), systemic HRT ($P = .002$), and no history of cardiovascular disease ($P = .001$) were associated with less sexual discomfort. The odds ratio of being sexually active increased with younger age, no breast cancer, better quality of life, and more care from partner.

Conclusions: Our results indicate that other factors than hormone levels are important for sexual functioning, although systemic HRT can have a positive impact on sexual functioning in women who have undergone RRSO. Testosterone therapy could improve women's sexual functioning after RRSO; however, the inverse association between free androgen levels and sexual discomfort should be addressed in future studies. **Johansen N, Liavaag AH, Mørkird L, Michelsen TM. Hormone Levels and Sexual Functioning After Risk-Reducing Salpingo-Oophorectomy. Sex Med 2018;X:XXX–XXX.**

Key Words: *BRCA1* Gene; *BRCA2* Gene; Ovariectomy; Hormones; Sexuality; Hormone Replacement Therapy

INTRODUCTION

Ovarian cancer is the most lethal of gynecologic malignancies. Of women with breast cancer susceptibility (BRCA) gene mutations, up to 60% develop epithelial ovarian cancer.[1] Risk-reducing salpingo-oophorectomy (RRSO) lowers the risk of epithelial ovarian cancer by 80% in BRCA mutation carriers,[2] and the surgery is recommended at 35 to 45 years of age. RRSO implies removal of healthy organs from young, healthy individuals, and any side effects need particular attention. Most of a woman's estrogen and approximately half her testosterone are produced by the ovaries.[3] Hence, RRSO substantially decreases the levels of these hormones.[4] Women who undergo RRSO before natural menopause experience menopausal symptoms. Vasomotor symptoms and dyspareunia can be alleviated by hormone replacement therapy (HRT), but HRT does not seem to improve sexual pleasure.[5,6] Testosterone treatment has been shown to be effective in postmenopausal women with sexual dysfunction,[7–9] but the results are conflicting concerning the associations between sex hormone levels and sexual

Received October 3, 2017. Accepted February 4, 2018.

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https://doi.org/10.1016/j.esxm.2018.02.002

functioning.[4,8,10,11] Other investigators have examined sexual functioning after RRSO using the Sexual Activity Questionnaire with sexual pleasure and sexual discomfort as the main variables.[5,12] In a recent study, we found that women after RRSO had less sexual pleasure and more sexual discomfort than women from the general population. Davis et al[8] found a correlation between testosterone levels and sexual response in women; however, a 2014 review concluded that the obtained plasma androgen levels could not predict response to therapy.[13]

Several factors, especially psychosocial aspects, can affect sexual functioning.[14–16] Basson et al[17] suggested that female sexual functioning follows a complex and non-linear model that includes emotional intimacy, sexual stimuli, and relational satisfaction. Hence, variations in psychosocial conditions might overshadow a possible relation between hormone levels and sexual functioning, and other studies have not made these adjustments. Knowledge about associations between hormone levels and sexual functioning is limited and could be useful in the treatment of sexual dysfunction after RRSO.

Aims

Our primary aim was to examine the association between hormone levels and sexual functioning after adjustment for psychosocial and inter-relational aspects. Secondary aims were to investigate the association between systemic HRT and sexual functioning scores and to determine whether hormone levels were associated with sexual activity.

METHODS

Study Sample

The study sample was based on a group of women who had undergone RRSO. The indication for the preventive surgery was inherited increased risk of breast and ovarian cancer, and all women had genetic counseling before surgery at the Norwegian Radium Hospital (Oslo, Norway). We did not have access to the women's BRCA mutation status. 503 women were identified through surgical records from 3 Norwegian university hospitals. The women were invited to participate by mailed questionnaires; 361 responded and gave informed consent (response rate = 72%) after 1 reminder. 56 participants were excluded because of missing, incomplete, or inconsistent answers, and another 13 were excluded because of missing or unreliable dates of RRSO. Only the women who had RRSO in 1990 or later were included in the study. Sexually active women were those who had answered "yes" and sexually inactive women were those who answered "no" to the question, "Are you engaged in any sexual relation at the moment?" 198 sexually active women had a partner and were included as sexually active and 91 sexually inactive women were included (Figure 1). Except for date of birth and date of RRSO, we had no information about the non-responders. The women provided demographic and health-related information by filling out specific questionnaires. Blood samples for hormone analyses were collected at their general practitioners' offices.

Measures and Questionnaires

Except for age at survey and age at RRSO, all data were self-reported. Paired relationship was defined as being married or having an intimate relationship. High education was defined as more than 12 years. Systemic HRT was defined as preparations with systemic effect. Cardiovascular disease was defined as coronary heart disease or cerebral stroke. Obstructive pulmonary symptoms were defined as persistent cough and/or obstructive breathing. Musculoskeletal disorders or persistent symptoms were defined as osteoporosis, fibromyalgia, osteoarthritis, other musculoskeletal disorders, or persistent musculoskeletal pain or stiffness for at least 3 months.

The Sexual Activity Questionnaire is validated[18,19] and includes relationship status, reasons for sexual abstinence, and sexual functioning. Sexual pleasure consists of 6 items: "sex is important," "do enjoy sexual activity," "desire to have sex," "feel satisfied with sex," "frequency of sexual activity," and "satisfied with the frequency of sexual activity." The sexual discomfort

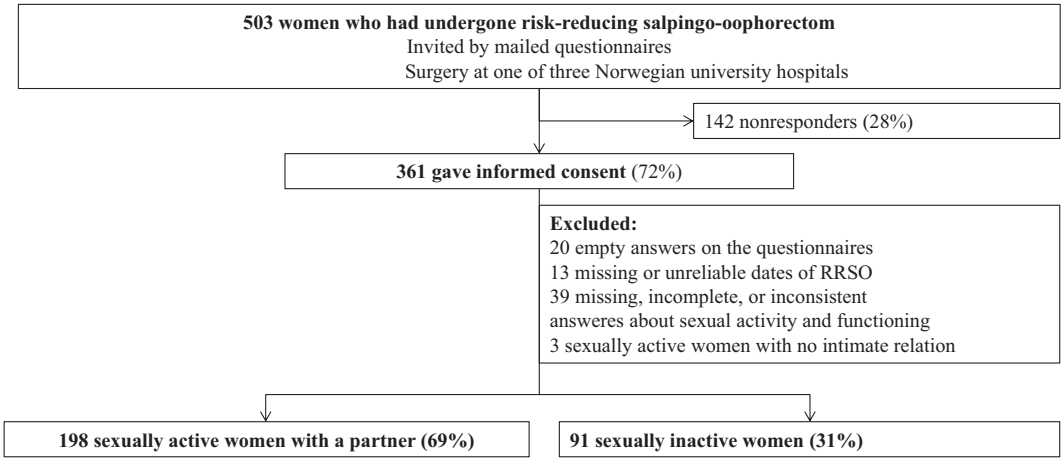

Figure 1. Inclusion of participants. RSSO = risk-reducing salpingo-oophorectomy.