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ORIGINAL ARTICLE

Baseline estradiol concentration in community-dwelling Japanese American men is not associated with intra-abdominal fat accumulation over 10 years

Beverly M. Kocarnik[a,b,c,*], **Edward J. Boyko**[a,b,d], **Alvin M. Matsumoto**[e,f], **Wilfred Y. Fujimoto**[b], **Tomoshige Hayashi**[d,g], **Donna L. Leonetti**[h], **Stephanie T. Page**[b]

[a] *General Medicine and Hospital and Specialty Medicine Services, Veterans Affairs Puget Sound Health Care System, Seattle, WA, United States*
[b] *Division of Endocrinology, Metabolism and Nutrition, Department of Medicine, University of Washington, Seattle, WA, United States*
[c] *Seattle Epidemiologic Research and Information Center, Veterans Affairs Puget Sound Health Care System, Seattle, WA, United States*
[d] *Division of General Internal Medicine, Department of Medicine, University of Washington, Seattle, WA, United States*
[e] *Geriatric Research, Education and Clinical Center, Veterans Affairs Puget Sound Health Care System, Seattle, WA, United States*
[f] *Division of Gerontology and Geriatric Medicine, Department of Medicine, University of Washington, Seattle, WA, United States*
[g] *Department of Preventive Medicine and Environmental Health, Graduate School of Medicine, Osaka City University, Osaka, Japan*
[h] *Department of Anthropology, University of Washington, Seattle, WA, United States*

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KEYWORDS
Estradiol;
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Summary
Problem: The role of plasma estradiol in the accumulation of intra-abdominal fat (IAF) in men is uncertain. Cross-sectional studies using imaging of IAF have shown either a positive or no association. In contrast, a randomised controlled trial using an

* Corresponding author at: University of Washington, Endocrinology/Diabetes Care Center, 3rd Floor, 4245 Roosevelt Way NE, Seattle, WA 98105, United States. Tel.: +1 2062774618; fax: +1 2067642563.
E-mail address: bmkocarnik@gmail.com (B.M. Kocarnik).

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Adiposity;
Japanese Americans

aromatase inhibitor to suppress estradiol production found an association between oestrogen deficiency and short-term IAF accumulation. No longitudinal study has been conducted to examine the relationship between plasma estradiol concentration and the change in IAF area measured using direct imaging.
Methods: This is a longitudinal observational study in community-dwelling Japanese-American men ($n = 215$, mean age 52 years, BMI 25.4 kg/m^2). IAF and subcutaneous fat areas were assessed using computerized tomography (CT) at baseline, 5 and 10 years. Baseline plasma estradiol concentrations were measured using liquid chromatography-tandem mass spectrometry.
Results: Univariate analysis found no association between baseline estradiol concentration and baseline IAF, or 5- or 10-year changes in IAF area ($r = -0.05$ for both time points, $p = 0.45$ and $p = 0.43$, respectively). Multivariate linear regression analysis of the change in IAF area by baseline estradiol concentration adjusted for age, baseline IAF area, and weight change found no association with either the 5- or 10-year IAF area change ($p = 0.52$ and $p = 0.55$, respectively).
Conclusions: Plasma estradiol concentration was not associated with baseline IAF nor with change in IAF area over 5 or 10 years based on serial CT scans in community-dwelling Japanese-American men. These results do not support a role for oestrogen deficiency in IAF accumulation in men.

Introduction

Obesity is a well-established risk factor for many chronic diseases, including cardiovascular disease and diabetes mellitus. In addition to overall excess adiposity, the pattern of body fat deposition has been shown to affect risk for adiposity-related complications. Both cross-sectional and longitudinal data have demonstrated a higher risk of diabetes and cardiovascular disease in association with increased intra-abdominal compared to subcutaneous fat [1—3].

Men and premenopausal women typically have different patterns of fat deposition, with the former having more intra-abdominal fat compared to women, whose adipose tissue is distributed more commonly in the thighs and buttocks [4]. Observational data suggest that endogenous sex steroids play a role in these different patterns of fat deposition. Women experience a redistribution of adipose tissue towards a more central pattern of adiposity after menopause [4]. Adipose tissue contains both oestrogen and androgen receptors, and expresses aromatase, the enzyme that converts testosterone to estradiol [4,5]. These proteins likely facilitate local sex steroid effects which could contribute to the regulation of regional adipose tissue deposition [5].

A recent large interventional study examined the effects of oestrogen deficiency of fat accumulation in men by pharmacologically lowering estradiol concentration with an aromatase inhibitor to suppress the conversion of testosterone to estradiol. This study included 202 men who received anastrozole for 16 weeks (in combination with a GnRH antagonist and testosterone transdermal gel) and demonstrated an inverse relationship between estradiol concentrations and changes in intra-abdominal fat area [6]. The authors concluded that endogenous estradiol likely plays an important role in the regulation of adiposity in men, and in regulating intra-abdominal fat mass in particular.

No observational research has been conducted with adequate rigour to determine whether physiologic concentrations of oestrogen in men predict fat accumulation in the important intra-abdominal depot. Several cross-sectional studies have examined the association between estradiol concentrations and regional adiposity in men, but this study design cannot establish whether estradiol concentration preceded change in the intra-abdominal fat depot. Of 13 cross-sectional studies examining this association, 5 found a positive association and 8 found no association between circulating estradiol concentrations and overall or regional adiposity [7—19]. These studies used

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